Cisco Nexus 9500 Cloud-Scale Line Cards and Fabric Modules

Contents

Product overview

The Cisco Nexus® 9500 switching platform (Figure 1) offers three modular chassis:

- Cisco Nexus 9500 4-slot switch
- Cisco Nexus 9500 8-slot switch
- Cisco Nexus 9500 16-slot switch

Figure 1.
Cisco Nexus 9500 Series Cloud-Scale Switch Chassis

The Cisco Nexus 9500 Series modular switches support a comprehensive selection of cloud-scale line cards and fabric modules that provide 1-, 10-, 25-, 40-, 50-, 100-, 200-, and 400-Gigabit Ethernet interfaces. A cloud scale line card provides up to 6.4 Terabits per second (Tbps) per slot and each cloud scale fabric module provides up to 1.6 Tbps to each line card slot. Using these cloud-scale line cards the Cisco Nexus 9500 Series switches can be configured with up to.

1. 192 400-Gigabit Ethernet ports (or)
2. 384 200-Gigabit Ethernet ports (or)
3. 1024 100-Gigabit Ethernet ports (or)
4. 2048 50-Gigabit Ethernet ports (or)
5. 1024 40-Gigabit Ethernet ports (or)
6. 2304 25-Gigabit Ethernet ports (or)
7. 2304 1/10-Gigabit Ethernet ports

Note: This data sheet specifies hardware capabilities only. Please refer to Cisco ACI or Cisco NX-OS software release notes and appropriate feature documentation for more details.

Cisco Nexus 9500 platform cloud-scale line cards

The Cisco Nexus 9500 platform supports a rich selection of hot-swappable multispeed cloud-scale line cards and fabric modules optimized for data-center deployments. These cloud-scale line cards and fabric modules, built using Cisco® cloud-scale ASICs, provide the ideal foundation for large scalable data centers. The Cisco clouds-scale ASICs provide enhanced performance and features that are required to meet the evolving needs of the world's largest cloud-scale data centers. These ASICs not only support foundational L2/L3 networking capabilities but also support enhanced capabilities such as policy-based fabric architectures (ACI or VXLAN), smart buffering, integrated line rate security, and real-time streaming telemetry over multispeed Ethernet ports.

The latest Cisco® 400-Gigabit cloud-scale ASICs also support Segment Routing over IPv6 (SRv6) and enhanced streaming telemetry capabilities.

Table 1. Cisco Nexus 9500 cloud-scale line cards

Line Card Type	Description
400-Gbps line cards	
N9K-X9716D-GX: 400-Gigabit Ethernet Line Card 	• 16-port 400-Gigabit Ethernet Quad Small Form-Factor Pluggable Double Density (QSFP-DD) line card • Every port is 1x400-, 4x100-, 2x100G-, 4x50-, 4x40-, 4x25-, and 4x10-Gigabit Ethernet breakout capable*
100-Gbps line cards	
N9K-X9736C-FX: 100-Gigabit Ethernet Line Card 	• 36-port 100-Gigabit Ethernet Quad Small Form-Factor Pluggable 28 (QSFP28) line card • Every port is 1x100-, 2x50-, 1x40-, 4x25-, 4x10-, and 1x10-Gigabit Ethernet breakout capable* • Ports 1 – 28 support 1 Gigabit Ethernet
N9K-X9732C-EX: 100-Gigabit Ethernet Line Card 	• 32-port 100-Gigabit Ethernet Quad Small Form-Factor Pluggable 28 (QSFP28) line card • Every port is 1x100-, 2x50-, 1x40-, 4x25-, 4x10-, and 1x1/10-Gigabit Ethernet breakout capable*
N9K-X9732C-FX: 100-Gigabit Ethernet Line Card 	• 32-port 100-Gigabit Ethernet Quad Small Form-Factor Pluggable 28 (QSFP28) line card • Every port is 1x100-, 2x50, 1x40-, 4x25-, 4x10-, and 1x1/10-Gigabit Ethernet breakout capable* • Supports 4+1 FM redundancy
N9K-X9736C-EX: 100-Gigabit Ethernet Line Card 	• 36-port 100-Gigabit Ethernet Quad Small Form-Factor Pluggable 28 (QSFP28) line card • Every port is 1x100-, 2x50-, 1x40-, 4x25-, 4x10-, and 1x1/10-Gigabit Ethernet breakout capable*
10/25-Gbps Fiber Line Cards	
N9K-X97160YC-EX: 1/10/25-Gigabit Ethernet Access-Layer and 10/40/100-Gigabit Ethernet Aggregation-Layer Line Card 	• 48-port 1-, 10-, and 25-Gigabit Ethernet SFP+ and 4-port 40/100-Gigabit Ethernet QSFP28 line card

Line Card Type	Description
10-Gbps copper line cards	
N9K-X9788TC-FX: 1/10 Gigabit Ethernet BaseT Access-Layer and 40/100 Gigabit Ethernet Aggregation-Layer Line Card 	• 48-port 100-Megabit and 1/10-Gigabit Ethernet BASE-T and 4-port 40/100-Gigabit Ethernet QSFP28 line card

* Breakout capability requires the availability of appropriate breakout cables and software support. Please check Cisco ACI and Cisco NX-OS software release notes and the Cisco Optics Compatibility Matrix for the latest available support.

Table 2. Cisco Nexus 9500 cloud-scale line card use-case summary

Line Card/Features	Cisco NX-OS	Cisco ACI® spine	MACSec	N+1 FM redundancy
X9716D-GX	Yes	Yes	Yes	No
X9736C-FX	Yes	Yes	Yes	No
X9732C-EX	Yes	Yes	No	No
X9732C-FX	Yes	No	Yes	Yes
X9736C-EX	Yes	No	No	No
X97160YC-EX	Yes	No	No	No
X9788TC-FX	Yes	No	Yes	No

Table 3. Cisco Nexus 9500 cloud-scale line card specifications

Line card	FM required for max bandwidth	FM required for N+1 redundancy	Performance	Packet buffer
X9716D-GX	4	N/A	12.8 Tbps 4.3 bpps	160 MB
X9732C-EX	4	N/A	6.4 Tbps 4.3 bpps	160 MB
X9736C-FX	5*	N/A	7.2 Tbps 2.4 bpps	160 MB
X9732C-FX	4	5#	6.4 Tbps 2.16 bpps	160 MB
X9736C-EX	4	N/A	6.4 Tbps 4.9 bpps	160 MB

Line card	FM required for max bandwidth	FM required for N+1 redundancy	Performance	Packet buffer
X97160YC-EX	4	N/A	3.2 Tbps 2.17 bpps	80 MB
X9788TC-FX	4	N/A	1.76 Tbps 0.59 bpps	80MB

[*] To achieve max bandwidth with 5 fabric modules and X9736C-FX cards, the line cards in the chassis must only be the X9736C-FX cards. The X9736C-FX cards supports up to 6.4Tbps when mixed with other line cards and 4 fabric modules.

[#] To achieve N+1 fabric module redundancy with 5 fabric modules and X9732C-FX cards, the line cards in the chassis must only be the X9732C-FX cards.

Select EX, FX, and GX line cards can be installed together in the same Cisco Nexus 9500 chassis. In such a configuration, the chassis supports a maximum of four fabric modules and any additional fabric modules installed will be powered down. Any features or capabilities that require more than four fabric modules will be automatically disabled in such a configuration.

Cisco Nexus 9500 cloud-scale platform fabric modules and performance

The Cisco Nexus 9500 platform is designed as a Clos fabric that interconnects each line card directly with each rear-mounted fabric module. All traffic between the line cards is load balanced across all fabric modules, providing optimal bandwidth distribution within the chassis. This load-balancing capability provides enhanced system reliability and redundancy. The switch continues to operate even in the event of a loss of a fabric module, albeit at a lower capacity, as the remaining fabric modules continue to provide switching capacity to the line cards.

The Cisco Nexus 9500 Cloud Scale platform supports the following fabric modules:

- 4-slot and 8-slot FM-G fabric modules that provide up to 1.6 Tbps capacity per line card slot.
- 8-slot and 16-slot FM-E2 fabric modules that provide up to 800 Gbps capacity per line card slot.
- 4-slot, 8-slot, and 16-slot FM-E fabric modules that provide up to 800 Gbps capacity per line card slot.

These fabric modules provide upgradability and investment protection for the Cisco Nexus 9500 Series chassis. All fabric modules installed in a chassis should be of the same type.

Table 4. Cisco Nexus 9500 cloud-scale line cards and FM-G Fabric Module Compatibility

Line card/FM	C9504-FM-G	C9508-FM-G
X9716D-GX	Cisco ACI spine and Cisco NX-OS	Cisco ACI spine and Cisco NX-OS
X9736C-FX	Cisco ACI spine and Cisco NX-OS	Cisco ACI spine and Cisco NX-OS
X9732C-EX	Cisco ACI spine and Cisco NX-OS	Cisco ACI spine and Cisco NX-OS
X9732C-FX	Cisco NX-OS	Cisco NX-OS
X9736C-EX	Cisco NX-OS	Cisco NX-OS
X97160YC-EX	Cisco NX-OS	Cisco NX-OS
X9788TC-FX	Cisco NX-OS	Cisco NX-OS

Table 5. Cisco Nexus 9500 cloud-scale line cards and FM-E/E2 Fabric Modules Compatibility

Line card/FM	C9504-FM-E	C9508-FM-E	C9516-FM-E	C9508-FM-E2	C9516-FM-E2
X9716D-GX	N/A	N/A	N/A	N/A	N/A
X9736C-FX	Cisco ACI spine and Cisco NX-OS	Cisco ACI spine and Cisco NX-OS	Cisco NX-OS	Cisco ACI spine and Cisco NX-OS	Cisco ACI spine and Cisco NX-OS
X9732C-EX	Cisco ACI spine and Cisco NX-OS	Cisco ACI spine and Cisco NX-OS	Cisco NX-OS	Cisco ACI spine and Cisco NX-OS	Cisco ACI spine and Cisco NX-OS
X9732C-FX	Cisco NX-OS	Cisco NX-OS	Cisco NX-OS	Cisco NX-OS	Cisco NX-OS
X9736C-EX	Cisco NX-OS	Cisco NX-OS	Cisco NX-OS	Cisco NX-OS	Cisco NX-OS
X97160YC-EX	Cisco NX-OS	Cisco NX-OS	Cisco NX-OS	Cisco NX-OS	Cisco NX-OS
X9788TC-FX	Cisco NX-OS	Cisco NX-OS	Cisco NX-OS	Cisco NX-OS	Cisco NX-OS

The Cisco Nexus 9500 Cloud Scale line cards support several forwarding templates to efficiently allocate onboard memory for varying deployment scenarios.

Note: This data sheet specifies hardware capabilities only. Please refer to Cisco ACI or Cisco NX-OS software release notes and appropriate feature documentation for more details.

Table 6. Cisco Nexus 9500 Cloud-Scale Line Cards: Product Specifications – Performance and Scale[1]

	Cisco Nexus 9500 Series cloud-scale line cards (X9716D-GX)	Cisco Nexus 9500 Series cloud-scale line cards (X9736C-FX, X9732C-FX, X9788TC-FX)	Cisco Nexus 9500 Series cloud-scale line cards (X9732C-EX, X9736C-EX, X97160YC-EX)
Number of Longest Prefix Match (LPM) route entries	IPv4: Upto 2 million IPv6: 1,900 to 1 million (based on prefix length)	IPv4: Up to 2 million IPv6: 1,900 to 1 million (based on prefix length)	IPv4: up to 1 million IPv6: 1900 to 500,000 (based on prefix length)
Number of IP host entries	IPv4: up to 2 million IPv6: up to 32,000	IPv4: up to 2 million IPv6: up to 32,000	IPv4: up to 1 million IPv6: up to 16,000
Number of MAC address entries	Up to 1 million	Up to 512,000	Up to 512,000
Number of multicast routes	Up to 131,000	Up to 131,000	Up to 32,000
Number of Interior Gateway Management Protocol (IGMP) snooping groups	With VPC: 4000 to 32,000 Without VPC: 8000 to 32,000	With VPC: 4000 to 32,000 Without VPC: 8000 to 32,000	With VPC: 4000 to 32,000 Without VPC: 8000 to 32,000
Number of VLANs	Up to 4096	Up to 4096	Up to 4096
Number of Virtual Routing and Forwarding (VRF) instances	Up to 16,000	Up to 16,000	Up to 16,000
Number of port channels	Up to 512	Up to 512	Up to 512
Number of port channel links	Up to 32	Up to 32	Up to 32
Number of Equal Cost Multipath (ECMP) paths	Up to 64	Up to 64	Up to 64
Number of active Cisco Switched Port Analyzer (SPAN) sessions	4 to 32	4 to 32	4 to 32
Number of Multiple Spanning Tree (MST) instances	Up to 64	Up to 64	Up to 64
Number of Rapid per-VLAN Spanning Tree (RPVST) instances	Up to 4000	Up to 4000	Up to 4000
Number of Hot Standby Router Protocol (HSRP) groups	Up to 490	Up to 490	Up to 490
Number of tunnel endpoints (VTEP) and VXLAN physical servers per VLAN	Up to 10,000	Up to 10,000	Up to 10,000

Supported optics modules

Each Cisco Nexus 9500 cloud-scale line card supports an extensive set of optic modules. The Cisco Optics Compatibility Matrix (https://tmgmatrix.cisco.com/home) provides the list of optics supported on each line card.

Mechanical specifications

Table 7. Cisco Nexus 9500 Cloud-Scale Line Cards: Product Specifications – Mechanical

	X9716D-GX	X9732C-EX	X9736C-FX	X9732C-FX	X9736C-EX	X97160YC-EX	X9788TC-FX
Weight	15.2 lb 6.8 kg	12.13 lb 5.5 kg	14.38 lb 6.5 kg	15 lb 6.8 kg	14.77 lb 6.7 kg	12.75 lb 5.78 kg	13 lb 5.9 kg
Typical power	650 W	430 W	607 W	520 W	632 W	415 W	513 W
Maximum power	1680 W	720 W	900 W	840 W	792 W	516 W	684 W
Mean Time Between Failure (MTBF) hours	338,442	481,470	420,050	429,090	476,970	580,050	429,630
Hot swappable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Airflow	Port-side intake	Port-side intake	Port-side intake	Port-side intake	Port-side intake	Port-side intake	Port-side intake

Table 8. Cisco Nexus 9500 FM-G Cloud-Scale Fabric Modules: Product Specifications – Mechanical

	N9K-C9504-FM-G	N9K-C9508-FM-G
Total capacity	6.4 Tbps	12.8 Tbps
Capacity (per slot)	1.6 Tbps	1.6 Tbps
Maximum flow size	400 Gbps	400 Gbps
Weight	7.7 lb (3.4 kg)	14.08 lb (6.3 kg)
Typical power	455 W	685 W
Maximum power	504 W	936 W
MTBF hours	551,390	455,270
Hot swappable	Yes	Yes
Airflow	Port-side intake	Port-side intake

Table 9. Cisco Nexus 9500 Cloud-Scale FM-E/E2 Fabric Modules: Product Specifications – Mechanical

	N9K-C9504-FM-E	N9K-C9508-FM-E	N9K-C9508-FM-E2	N9K-C9516-FM-E	N9K-C9516-FM-E2
Total capacity	3,200 Gbps	6,400 Gbps	6,400 Gbps	12,800 Gbps	12,800 Gbps
Capacity (per slot)	800 Gbps	800 Gbps	800 Gbps	800 Gbps	800 Gbps
Maximum flow size	100 Gbps	100 Gbps	100 Gbps	50 Gbps	100 Gbps
Weight	6.6 lb (2.98 kg)	11.6 lb (5.28 kg)	10.94 lb (5.0 kg)	22.7 lb (10.3 kg)	20.31 lb (9.21 kg)
Typical power	234 W	455 W	266 W	980 W	439 W
Maximum power	313 W	570 W	420 W	1320 W	900 W
MTBF hours	829,890	653,420	642,820	363,100	515,870
Hot swappable	Yes	Yes	Yes	Yes	Yes
Airflow	Port-side intake	Port-side intake	Port-side intake	Port-side intake	Port-side intake

Regulatory standards compliance

Table 10. Regulatory standards compliance: safety and EMC

Specification	Description
Regulatory compliance	Products should comply with CE Markings according to directives 2004/108/EC and 2006/95/EC
Safety	• UL 60950-1 Second Edition • CAN/CSA-C22.2 No. 60950-1 Second Edition • EN 60950-1 Second Edition • IEC 60950-1 Second Edition • AS/NZS 60950-1 • GB4943
EMC: Emissions	• 47CFR Part 15 (CFR 47) Class A • AS/NZS CISPR22 Class A • CISPR22 Class A • EN55022 Class A • ICES003 Class A • VCCI Class A • EN61000-3-2 • EN61000-3-3 • KN22 Class A • CNS13438 Class A

Specification	Description
EMC: Immunity	• EN55024 • CISPR24 • EN300386 • KN 61000-4 series
RoHS	The product is RoHS-6 compliant with exceptions for leaded-Ball Grid-Array (BGA) balls and lead press-fit connectors.

Ordering information

Table 11. Cisco Nexus 9500 Cloud-Scale Line Cards: ordering information

Part Number	Product Description
N9K-X9716D-GX (=)	Cisco Nexus 9500 16p 400G QSFP-DD cloud-scale line card
N9K-X9732C-EX (=)	Cisco Nexus 9500 32p 100G QSFP cloud-scale line card
N9K-X9736C-FX (=)	Cisco Nexus 9500 36p 100G QSFP cloud-scale line card
N9K-X9732C-FX(=)	Cisco Nexus 9500 32p 100G QSFP cloud-scale line card
N9K-X9736C-EX(=)	Cisco Nexus 9500 36p 100G QSFP cloud-scale line card
N9K-X97160YC-EX(=)	Cisco Nexus 9500 48p 1/10/25G SFP+ plus 4p 100G QSFP cloud-scale line card
N9K-X9788TC-FX(=)	Cisco Nexus 9500 48p 1/10G BaseT plus 4p 100G QSFP cloud-scale line card

Table 12. Cisco Nexus 9500 Cloud-Scale Fabric Modules ordering information

Part Number	Product Description
N9K-C9504-FM-G(=)	Cisco Nexus 9500 4-slot 1.6Tbps cloud-scale fabric module
N9K-C9508-FM-G(=)	Cisco Nexus 9500 8-slot 1.6Tbps cloud-scale fabric module
N9K-C9504-FM-E(=)	Cisco Nexus 9500 4-slot 800Gbps cloud-scale fabric module (100G flows)
N9K-C9508-FM-E(=)	Cisco Nexus 9500 8-slot 800Gbps cloud-scale fabric module (100G flows)
N9K-C9516-FM-E(=)	Cisco Nexus 9500 16-slot 800Gbps cloud-scale fabric module (50G flows)
N9K-C9508-FM-E2(=)	Cisco Nexus 9500 8-slot 800Gbps cloud-scale fabric module (100G flows)
N9K-C9516-FM-E2(=)	Cisco Nexus 9500 16-slot 800Gbps cloud-scale fabric module (100G flows)

Note: All part numbers with “=” sign refer to Spare part numbers for ordering.

Warranty

The Cisco Nexus 9500 platform has a 1-year limited hardware warranty. The warranty includes hardware replacement with a 10-day turnaround from receipt of a Return Materials Authorization (RMA).

Cisco environmental sustainability

Information about Cisco's environmental sustainability policies and initiatives for our products, solutions, operations, and extended operations or supply chain is provided in the "Environment Sustainability" section of Cisco's Corporate Social Responsibility (CSR) Report.

Reference links to information about key environmental sustainability topics (mentioned in the "Environment Sustainability" section of the CSR Report) are provided in the following table:

Sustainability topic	Reference
Information on product material content laws and regulations	Materials
Information on electronic waste laws and regulations, including products, batteries, and packaging	WEEE compliance

Cisco makes the packaging data available for informational purposes only. It may not reflect the most current legal developments, and Cisco does not represent, warrant, or guarantee that it is complete, accurate, or up to date. This information is subject to change without notice.

Service and Support

Cisco offers a wide range of services to help accelerate your success in deploying and optimizing the Cisco Nexus 9500 platform in your data center. These innovative Cisco Services offerings are delivered through a unique combination of people, processes, tools, and partners and are focused on helping you increase operational efficiency and improve your data center network.

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Spanning the entire network lifecycle, Cisco Services offerings help increase investment protection, optimize network operations, support migration operations, and strengthen your IT expertise.

Cisco Capital

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For more information

For more information about the Cisco Nexus 9000 Series, please visit https://www.cisco.com/go/nexus9000.

Document history

New or revised topic	Described in	Date
Updated MACsec support details.	Line card use-case summary (Table 2)	September 12, 2023

Americas Headquarters
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