Cisco Catalyst 9500 Series Switches

Contents

Introduction

Reimagine, Reinforce, Redefine

The Catalyst 9500 Series, including the Catalyst 9500X models, continues to shape the future with continued innovation that helps you reimagine connections, reinforce security and redefine the experience for your hybrid workforce big and small.

Cisco Catalyst 9500 Series switches based on Cisco Unified Access Data Plane (UADP) Application-Specific Integrated Circuit (ASIC) are Cisco's lead fixed enterprise core and aggregation switching platform and as part of the Catalyst 9000 family, are built to transform your network to handle a hybrid world where the workplace is anywhere, endpoints could be anything, and applications are hosted all over the place.

Cisco Catalyst 9500X switch based on Cisco Silicon One Q200 ASIC is purpose built for the next generation core with a programmable pipeline (P4) and is the first network silicon to offer switching capacity up to 12.8 Tbps full duplex in the enterprise. The Q200 ASIC offers high-performance along with full routing and switching capabilities without external memories. This is enabled by internal architecture that includes an on-chip High Bandwidth Memory (HBM). The Catalyst 9500X switch leverages a high- performance multiple core x86 CPU, and is Cisco's leading purpose-built fixed core and edge services enterprise switching platform, built for security, IoT, and cloud.

Cisco Catalyst 9500X switch is the industry's first purpose-built fixed 10, 25, 50, 40, 100, 200 and 400 Gigabit Ethernet switch targeted for the enterprise campus. The Catalyst 9500X switch delivers unmatched forwarding scale (MAC addresses, IP unicast and multicast routes, MPLS labels) and deep buffering for enterprise applications. The Catalyst 9500X models includes non-blocking 50 Gigabit Ethernet Small Form-Factor Pluggable (SFP-56) and non-blocking 400 Gigabit Ethernet Quad Small Form-Factor Pluggable Double Density (QSFP-DD) ports.

Catalyst 9500 Series switches support advanced routing and infrastructure services (such as Multiprotocol Label Switching [MPLS] Layer 2 and Layer 3 VPNs, Multicast VPN [MVPN], and Network Address Translation [NAT]); Cisco Software-Defined Access capabilities (such as a host tracking database, cross-domain connectivity, and VPN Routing and Forwarding [VRF]-aware Locator/ID Separation Protocol [LISP]); and network system virtualization with Cisco StackWise Virtual technology that are critical for their placement in the campus core. The Cisco Catalyst 9500 Series also supports foundational high-availability capabilities such as patching, Cisco Nonstop Forwarding with Stateful Switchover (NSF/SSO), redundant platinum-rated power supplies, and fans, while supporting a wide array of optics. Catalyst 9500 Series switches provide operational choice of Cisco Catalyst Center, or Meraki cloud monitoring.

The foundation of Software-Defined Access

The enterprise network lies at the heart of digital transformation. A network that is open, programmable, integrated, and secure maximizes business agility, allowing new business opportunities to be pursued and captured.

The Cisco Networking Cloud with Software-Defined Access (SD-Access) is the network fabric that powers business. Cisco SD-Access is an open and extensible, software-driven architecture that accelerates and simplifies your enterprise network operations. SD-Access enables policy-based automation from edge to cloud with foundational capabilities.

Product overview

Cisco Catalyst 9500X models

- The Cisco Silicon One Q200 Application-Specific Integrated Circuit (ASIC) is purpose built for the next generation network core + edge switch. It is the first enterprise ASIC to offer speeds up to 12.8 Tbps full duplex with 8 Bpps of forwarding performance, while supporting high-performance and full routing and switching capabilities without external memories.
- The Cisco Silicon One Q200 ASIC is built on 7nm fabrication technology, capable of high performance while maintaining a low power footprint.
- Up to 12.8 (switching ASIC capacity) Tbps switching capacity with 8 Bpps forwarding rate.
- 80MB of dedicated low-latency buffer, with up to 8GB of HBM buffer for deep packet buffers.
- Up to 28 native nonblocking 40/100 Gigabit Ethernet QSFP28 ports.
- Up to 60 native nonblocking 10/25/50 Gigabit Ethernet SFP56 ports.
- Up to 8 native nonblocking 40/100/200/400 Gigabit Ethernet QSFPDD ports.
- Intel 2.3-GHz x86 CPU with 8 cores and 32-GB of DDR4 memory.
- Up to 960 GB of SSD local storage for container-based application hosting (2x 10G KR ports).
- Flexible routing (IPv4, IPv6, and multicast) tables, Layer 2 tables, ACL tables, and QoS tables.
- ASIC tables for switching scale up to 256K MAC addresses and routing scale up to 2M routes.
- Dual-stack IPv4/IPv6 and dynamic hardware forwarding table allocations, for ease of IPv4-to-IPv6 migration.
- Hardware support for Application Hosting.
- Hardware support for line-rate 256-bit 802.1ae MACsec and WAN-MACsec data encryption.
- Cisco StackWise Virtual technology, a network system virtualization technology that increases operational efficiency and boosts nonstop communications and scaled system bandwidth. Multichassis EtherChannel can be configured across StackWise-Virtual members for high resiliency.
- Platinum-rated (90% efficient) 1500 Watt AC and/or DC power supplies.
- Field-replaceable, N+1 redundant fan-tray units, with an added flexibility to choose the direction of airflow.

Cisco Catalyst 9500 models

- The Cisco Unified Access Data Plane (UADP) Application-Specific Integrated Circuit (ASIC) ready for next-generation technologies with its programmable pipeline, microengine capabilities, and template-based, configurable allocation of Layer 2 and Layer 3 forwarding, Access Control Lists (ACLs), and Quality-of-Service (QoS) entries.
- Up to 6.4 Tbps switching capacity with up to 2 Bpps of forwarding performance.
- Up to 36 MB of unified buffer per ASIC.
- Intel 2.4-GHz x86 CPU with up to 120 GB of USB 3.0 or up to 960 GB of SATA SSD storage for container-based application hosting.
- Up to 32 nonblocking 100 Gigabit Ethernet QSFP28 ports.
- Up to 32 nonblocking 40 Gigabit Ethernet QSFP+ ports.
- Up to 48 nonblocking 25 Gigabit Ethernet SFP28 ports.
- Up to 48 nonblocking 10 Gigabit Ethernet SFP+ ports.
- Scalable Layer 3 routing (IPv4, IPv6, and multicast) tables and Layer 2 switching tables.
- Hardware support for Application Hosting.
- IEEE 802.1ba AV Bridging (AVB) built in to provide a better AV experience through improved time synchronization and QoS.
- Precision Time Protocol (PTP; IEEE 1588v2) provides accurate clock synchronization with sub-microsecond accuracy, making it suitable for distribution and synchronization of time and frequency over the network.
- Support for both static and dynamic NAT and Port Address Translation (PAT).
- Cisco StackWise Virtual technology, a network system virtualization technology that increases operational efficiency and boosts nonstop communications and scaled system bandwidth. Multichassis EtherChannel can be configured across StackWise-Virtual members for high resiliency.
- Platinum-rated (Greater than 90% efficient) AC and/pr DC power supplies.
- Field-replaceable fan-tray units.
- Meraki Cloud monitoring option.

Cisco IOS XE

This modern operating system for the enterprise provides support for model-driven programmability, on-box Python scripting, streaming telemetry, container-based application hosting, and patching for critical bug fixes. Cisco IOS XE also has built-in defenses to protect against runtime attacks.

- Simplified Campus Automation is designed to optimize the discovery and configuration of devices in your network with a more streamlined simple and easy-to-use automation tool. With features such as simplified discovery, IT can discover devices within the network within just a few steps. Also available is a more streamlined GUI that provides a better simplified view of switch configurations and software details on a port-by-port basis.
- **Cisco Plug and Play (PnP) enabled:** A simple, secure, unified, and integrated offering to ease new branch or campus device rollouts or updates to an existing network.
- **Automated device provisioning:** This is the ability to automate the process of upgrading software images and installing configuration files on Cisco Catalyst switches when they are being deployed in the network for the first time. Cisco provides both turnkey solutions such as Plug and Play (PnP) and off-the-shelf tools such as Zero-Touch Provisioning (ZTP) and Preboot Execution Environment (PXE) that enable an effortless and automated deployment.
- **API-driven configuration:** Modern network switches such the Cisco Catalyst 9500 Series support a wide range of automation features and provide robust open APIs over Network Configuration Protocol (NETCONF, RESTCONF and gNMI) using YANG data models for external tools, both off-the-shelf and custom built, to automatically provision network resources.
- **Granular visibility:** Model-driven telemetry provides a mechanism to stream data from a switch to a destination. The data to be streamed is driven through subscription to a data set in a YANG model. The subscribed data set is streamed out to the destination at configured intervals. Additionally, Cisco IOS XE enables the push model, which provides near- real-time monitoring of the network, leading to quick detection and rectification of failures.
- **Seamless software upgrades and patching:** To enhance OS resilience, Cisco IOS XE supports patching, which provides fixes for critical bugs and security vulnerabilities between regular maintenance releases. This support allows customers to add patches without having to wait for the next maintenance release.
- **Cloud monitoring for Catalyst:** Integrated view of Catalyst 9500 switches, seamlessly integrated into the Meraki dashboard experience. Cloud monitoring provides the ability to view Catalyst 9500 Series switch statistics, configuration, and troubleshooting capabilities. While the switch will be automatically tagged with " Monitor Only" in the dashboard to distinguish from fully managed Meraki switches, " Monitor Only" Catalyst 9500 switch appears and functions very similarly to Meraki MS switches in the dashboard, including a visual representation of connected ports and traffic information. With cloud monitoring, Cisco IOS XE features, configuration and management continues to be done via The various automation mechanisms are outlined above. As a monitoring tool, most operations are read-only. All live troubleshooting capabilities will also not result in persistent changes to configuration following the troubleshooting operation.
- **WebUI:** Embedded GUI-based device-management tool that provides the ability to provision the device, to simplify device deployment and manageability and to enhance the user experience. WebUI comes with the default image. There is no need to enable anything or install any license on the device. You can

use WebUI to build a day-1 configuration and from then on monitor and troubleshoot the device without having to know how to use the CLI.

Platform benefits

Table 1. Platform benefits

Model	Catalyst 9500	Catalyst 9500X
Resiliency and High Availability		
Software Maintenance Upgrade (SMU)	Yes	Yes
Cisco StackWise Virtual	Yes	Yes[3]
Stateful Switchover (SSO)	Yes (SVL)	Yes (SVL)[3]
In-Service Software Upgrade (ISSU)	Yes (SVL)	Yes (SVL)[3]
Graceful Insertion and Removal (GIR)	Yes	Yes
MKA High Availability	Yes	No[1]
Enterprise Security		
Trustworthy Solutions	Yes	Yes
Image Signing	Yes	Yes
Secure Boot	Yes	Yes
Cisco Trust Anchor Module	Yes	Yes
MACsec Encryption (256-bit AES-GCM)	Yes	Yes
Cisco WAN MACsec (256-bit AES-GCM)	No	Yes[2,5]
Object-Group ACLs (IPv4/IPv6)	Yes	Yes[4]
Enterprise QoS		
Modular QoS CLI (MQC)	Yes	Yes
Strict Priority Queuing	Yes	Yes
Class/Color-aware Queuing	Yes (WFQ)	Yes (VoQ)
Policing/Metering	Yes	Yes
Shaping/Bandwidth	Yes	Yes
Hierarchical QoS	Yes (2-level)	Yes (2-level)
IP Routing		
Routing Information Protocol version 2 (RIPv2),	Yes	Yes

Model	Catalyst 9500	Catalyst 9500X
and next generation [RIPng]		
Open Shortest Path First version 2 (OSPFv2), and OSPFv3	Yes	Yes
Enhanced Interior Gateway Routing Protocol (EIGRP), and EIGRPv6	Yes	Yes
Intermediate System-to-Intermediate System Version 4 (IS-ISv4)	Yes	Yes
Border Gateway Protocol Version 4 (BGPv4), and BGPv6	Yes	Yes
Protocol-Independent Multicast (PIM) Sparse-Mode (PIM-SM)	Yes	Yes
PIM Source-Specific Mode (PIM-SSM)	Yes	Yes
Bidirectional PIM (PIM-BIDIR)	Yes	No[1]
IPv6 routing	Yes	Yes
L3 Routed Sub-Interfaces	Yes	Yes
Multi-Protocol Label Switching (MPLS)		
MPLS L3 VPN	Yes	Yes
Ethernet over MPLS (EoMPLS)	Yes	Yes
Virtual Private LAN Service (VPLS)	Yes	No[1]
MPLS over GRE	Yes	No[1]
MPLS Traffic-Engineering (MPLS-TE)	Yes	Yes
BGP Ethernet VPN (EVPN) VXLAN		
Fabric Spine, Leaf and Border Support	Yes	Yes[3]
L2/L3 Virtual Network Interface (VNI)	Yes	Yes[3]
Distributed Anycast Gateway (Symmetric IRB)	Yes	Yes[3]
Centralized Gateway (Asymmetric IRB)	Yes	No
ESI Multi-Home Support	Yes	No
Tenant Routed Multicast (IPv4/IPv6)	Yes	Yes[3]
L3 Border Handoff: Multi-VRF, MPLS L3VPN	Yes	Yes[3]
L2 Border Handoff: VPLS, EoMPLS L2VPN	Yes	No[1]

Model	Catalyst 9500	Catalyst 9500X
Software-Defined Access (SD-Access)		
Virtual eXtensible LAN (VXLAN)	Yes	Yes
L2 Virtual Network Interface (VNI)	Yes	Yes
L3 Virtual Network Interface (VNI)	Yes	Yes
SDA Control-Plane	Yes	Yes
SDA Border	Yes	Yes
SDA Layer 2 Border	Yes	No
SDA Edge	Yes	No
Flexible NetFlow (FNF)		
FNF IPv4 flow records	Yes	Yes[2] (software)
FNF IPv6 flow records	Yes	Yes[2] (software)
FNF sampler	Yes	Yes[2]
FNF data export	Yes	Yes[2]
NetFlow version 9 (NFv9) export	Yes	Yes[2]
IPFIX export	Yes	Yes[2]
Programmability		
NETCONF	Yes	Yes
RESTCONF	Yes	Yes
gNMI/gNOI	Yes	Yes
YANG Config models	Yes	Yes
YANG Oper models	Yes	Yes
ZTP/PnP	Yes	Yes
Smart Operations		
Bluetooth Ready	Yes	Yes[2]
RFID Tags	Yes	Yes
Blue Beacon	Yes	Yes
Out of Band Device Mgmt	Yes (RJ45 and USB-mini type B)	Yes (RJ-45 and USB-C)

Model	Catalyst 9500	Catalyst 9500X
Meraki Cloud Monitoring	Yes	No

[1] C9500X models: feature is not available at FCS, but it is hardware capable.

[2] C9500X models: minimum IOS XE software release 17.8.1 (C9500X-28C8D) and 17.10.1 (C9500X-60L4D).

[3] C9500X models: minimum IOS XE software release 17.10.1 (C9500X-28C8D) and 17.11.1 (C9600X-60L4D). SSO support requires StackWise Virtual for fixed Catalyst 9500 models. ISSU supported on C9500X models starting with 17.12.1.

[4] C9500X models: Object-Group ACLs are supported only in the ingress direction.

[5] Need to order HSEC Key.

Platform details

Switch models and configurations

All switches ship with the 650W,950W,1500W or 1600W AC power supply as default

Figures 1 through 7 show the Cisco Catalyst 9500 Series Switches

Figure 1.
C9500X-28C8D: Cisco Catalyst 9500X switch with 28x 40/100G QSFP28 ports + 8x 40/100/200/400G Gigabit Ethernet

Figure 2.
C9500X-60L4D: Cisco Catalyst 9500X switch with 60x 10/25/50G Gigabit Ethernet + 4x 40/100/200/400G Gigabit Ethernet

Figure 3.
C9500-32C: Cisco Catalyst 9500 Series high-performance switch with 32x 100 Gigabit Ethernet

Figure 4.
C9500-32QC: Cisco Catalyst 9500 Series high-performance switch with 32x 40 or 16x100 Gigabit Ethernet

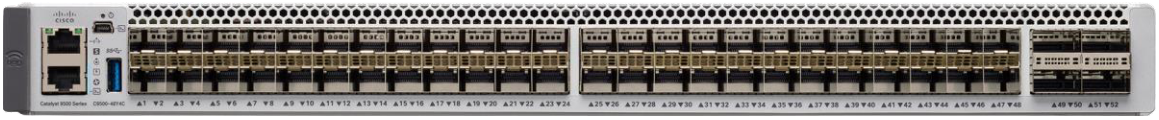

Figure 5.
C9500-48Y4C: Cisco Catalyst 9500 Series high-performance switch with 48x 1/10/25G Gigabit Ethernet + 4x 40/100G Uplink

Figure 6.
C9500-24Y4C: Cisco Catalyst 9500 Series high-performance switch with 24x 1/10/25G Gigabit Ethernet + 4x 40/100G Uplink

Figure 7.
C9500-16X: Cisco Catalyst 9500 Series switch with 16x 1/10G Gigabit Ethernet

Switch configurations and port density

Table 2 shows the Cisco Catalyst 9500X switch configurations.

Table 2. Cisco Catalyst 9500X switch configurations and port density

Model	Description	1G port density	10/25/50G port density	40/100G port density	400G port density	10/25G port density with breakout cable	50G port density with breakout cable	40G port density with breakout cable	100G port density with breakout cable
C9500X-28C8D	Cisco Catalyst 9500X with 28x100G + 8x400G Gigabit Ethernet	-	-	36	8	88 (120[1])	(64[1])	36 (60[1])	60
C9500X-60L4D	Cisco Catalyst 9500X with 60x50G + 4x400G Gigabit Ethernet	8[2]	60	4	4	76 (92[1])	60 (92[1])	4 (16[1])	16

[1] Hardware Capable. All numbers in the above table are for a single standalone switch.

[2] C9500X-60L4D only supports SFP-1G-SX/LH optics for 1Gbps. See Cisco TMG Matrix for details

Table 3 shows the Cisco Catalyst 9500 Series configurations

Table 3. Cisco Catalyst 9500 Series configurations and port density

Model	Description	1G port density	10G port density	25G port density	40G port density	100G Port density	10G port density with breakout cable	25G port density with breakout cable
C9500-32C	Cisco Catalyst 9500 Series high-performance 32-port 100 Gigabit Ethernet switch with QSFP28	-	-	-	32	32	96	96
C9500-32QC	Cisco Catalyst 9500 Series high-performance 32-port 40 Gigabit Ethernet switch with QSFP+	-	-	-	32	16	-	-
C9500-48Y4C	Cisco Catalyst 9500 Series high-performance 48-port 1/10/25G Gigabit Ethernet switch with SFP28	48	48	48	4	4	-	-
C9500-24Y4C	Cisco Catalyst 9500 Series high-performance 24-port 1/10/25G Gigabit Ethernet switch with SFP28	24	24	24	4	4	-	-
C9500-16X	Cisco Catalyst 9500 Series 16-port 1/10 Gigabit Ethernet switch with SFP/SFP+	16+8[1]	16+8[1]	-	2	-	8[1]	-

All numbers in the above table are for the standalone switch.

[1] with uplink module.

Network modules

The Cisco Catalyst 9500 Series Switches support optional network modules for uplink ports on some of the configurations.

The default switch configuration does not include the network module. When you purchase the switch, you can choose from the network modules described in Tables 4 and 5.

Table 4. Network module numbers and descriptions

Network module	Description
C9500-NM-8X	Cisco Catalyst 9500 Series Network Module 8-port 1/10 Gigabit Ethernet with SFP/SFP+
C9500-NM-2Q	Cisco Catalyst 9500 Series Network Module 2-port 40 Gigabit Ethernet with QSFP+

Table 5. Network module matrix

Model	C9500-NM-8X	C9500-NM-2Q
C9500X-28C8D	No	No
C9500X-60L4D	No	No
C9500-32C	No	No
C9500-32QC	No	No
C9500-48Y4C	No	No
C9500-24Y4C	No	No
C9500-16X	Yes	Yes

Figures 8 and 9 show the available network modules

Figure 8.
Cisco Catalyst 9500 Series network module 8-port 1/10 Gigabit Ethernet with SFP/SFP+

Figure 9.
Cisco Catalyst 9500 Series network module 2-port 40 Gigabit Ethernet with QSFP+

Accessories

The Cisco Catalyst 9500 Series Switches support optional accessories.

The default switch configuration ships with default 19” brackets. The accessories mentioned below need to be selected during configuration and ordered separately.

Table 6. Accessories and descriptions

Product number	Description
C9500X-ACCKIT-19I=	Accessory Kit for Cisco Catalyst 9500X Switch - 19" rack mount[1]
C9500X-ACCKIT-23I=	Accessory Kit for Cisco Catalyst 9500X Switch - 23" rack mount[1]
C9500X-4PTH-KIT=	Extension rails and brackets for four-point mounting for Cisco Catalyst 9500X Switch[1]
C9500-ACCKITH-19I=	Accessory Kit for Cisco Catalyst 9500 Series – High-End - 19" rack mount
C9500-ACCKITH-23I=	Accessory Kit for Cisco Catalyst 9500 Series – High-End - 23" rack mount
C9500-4PTH-KIT=	Extension rails and brackets for four-point mounting for Cisco Catalyst 9500 Series – High-End
C9500-ACC-KIT-19I=	Accessory Kit for Cisco Catalyst 9500 Series - 19" rack mount
C9500-ACC-KIT-23I=	Accessory Kit for Cisco Catalyst 9500 Series - 23" rack mount
C9500-4PT-KIT=	Extension rails and brackets for four-point mounting for Cisco Catalyst 9500 Series
C9K-F3-SSD-240GB	Cisco pluggable SSD storage – 240 GB (Catalyst 9500X)[1]
C9K-F3-SSD-480GB	Cisco pluggable SSD storage – 480 GB (Catalyst 9500X)[1]
C9K-F3-SSD-960GB	Cisco pluggable SSD storage – 960 GB (Catalyst 9500X)[1]
C9K-F1-SSD-240G	Cisco pluggable SSD storage – 240 GB
C9K-F1-SSD-480G	Cisco pluggable SSD storage – 480 GB
C9K-F1-SSD-960G	Cisco pluggable SSD storage – 960 GB

[1] Only supported on Catalyst C9500X models

Table 7. Accessory matrix

Model	C9500-ACCKITH-19I=	C9500-ACCKITH-23I=	C9500-4PTH-KIT=	C9500-ACC-KIT-19I=	C9500-ACC-KIT-23I=	C9500-4PT-KIT=	C9K-F1-SSD-240G	C9K-F1-SSD-480G	C9K-F1-SSD-960G
C9500-32C	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
C9500-32QC	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
C9500-48Y4C	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
C9500-24Y4C	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes

Model	C9500-ACCKITH-19I=	C9500-ACCKITH-23I=	C9500-4PTH-KIT=	C9500-ACC-KIT-19I=	C9500-ACC-KIT-23I=	C9500-4PT-KIT=	C9K-F1-SSD-240G	C9K-F1-SSD-480G	C9K-F1-SSD-960G
C9500-16X	No	No	No	Yes	Yes	Yes	No	No	No

Catalyst 9500X models have their own Accessory kits and SSD storage.

Refer to the Cisco Catalyst 9500X Series Switches Hardware Installation Guide for more information.

For C9500 high performance (C9500-24Y4C, C9500-48Y4C, C9500-32C, C9500-32QC) and C9500X switches, RFID tag is an optional selection. RFID tag can be opted out with the selection of C9500-RFID-NONE. RFID tag can be opted in by selecting C9500-RFID for C9500 high performance (C9500-24Y4C, C9500-48Y4C, C9500-32C, C9500-32QC) switches and C9500X-RFID for C9500X switches. UADP 2.0 based C9500-16X will continue to ship with RFID tags.

Note: For C9500 high performance (C9500-24Y4C, C9500-48Y4C, C9500-32C, C9500-32QC) and C9500X switches, it is important to make the right selection for RFID opt in / opt out at the time of ordering. RFID cannot be installed later, if it is opted out at the time of ordering.

Power supplies and fan tray

The Cisco Catalyst 9500 Series Switches support dual 1+1 redundant power supplies (AC or DC). The switches ship with one power supply by default. The second power supply can be purchased at the time the switch is ordered or at a later time. If only one power supply is installed, it should always be in power supply bay #1.

The Catalyst 9500 Series ship with up to five field-replaceable variable-speed fans. These have front-to-back airflow and can operate with up to one individual fan failure. The fan trays support fan-tray Online Insertion and Removal (OIR) and can support a maximum fan speed of up to 24,000 rpm.

Catalyst 9500X models ship with six field-replaceable variable-speed fan units. By default these have front-to-back (port-side intake) airflow fan units. The switch also has the option to select six back-to-front (port-side exhaust) airflow fans. The fan trays support fan-tray Online Insertion and Removal (OIR) and can support a maximum fan speed of up to 30,000 rpm.

Note: All Catalyst 9500X fan units must be the same type (either front-to-back or back-to-front). Mix and match of fan trays (front-to-back or back-to-front) is not supported.

Table 8. C9500X Fan Options

Product number	Description
C9500X-FAN-1U-R	Catalyst 9500X front to back cooling fan (maximum 6 per switch)
C9500X-FAN-1U-F	Catalyst 9500X back to front cooling fan (maximum 6 per switch)

Table 9 shows the maximum fans and fan trays for each configuration.

Table 9. C9500 Fan and Fan tray matrix

Model	FAN-T4-R (Max # of fans)	C9K-T1-FANTRAY (Max # of fans)	C9K-T2-FANTRAY (Max # of fans)
C9500-32C	No	No	Yes (5)
C9500-32QC	No	Yes (4)	No
C9500-48Y4C	No	Yes (4)	No
C9500-24Y4C	No	Yes (4)	No
C9500-16X	Yes (5)	No	No

Figures 10 to 13 show the power supplies available for the Cisco Catalyst 9500 Series

Figure 10.
950W AC power supply

Figure 11.
650W AC power supply (C9K-PWR-650WAC-R)

Figure 12.
1600W AC power supply

Figure 13.
650W AC power supply (C9K-PWR-650WACL-R)

Tables 10 and 11 provides more details on the Cisco Catalyst 9500X models power supplies.

Table 10. C9500X Power supply specifications

Power supply feature	C9K-PWR-1500WAC	C9K-PWR-1500WDC
Power max rating	1500	1500
Input-voltage range and frequency	90-264Vac 47-63Hz	-40Vdc to -72Vdc
Power supply efficiency	92% (115Vac 50% load) 94% (230Vac 50% load)	94% (-48Vdc to -60Vdc, 50% load)
Input current	17A (max) at Vac 100V 7A (max) at Vac 240V	45A (max) at -40Vdc
Output ratings	Main Output: 12V 125A Standby Output: 3.3V 5A	Main Output: 12V 125A Standby Output: 3.3V 5A
Output holdup time	12ms	2ms
Power-supply input receptacles	C22[1]	C10-638977-00 Amphenol Connector
Power cord rating	16A	N/A

[1] The Catalyst 9500X uses a different AC connector (C21) than the rest of the C9500 Product Family.

Note: The PSU has only one airflow direction (back to front) and supports two system airflows (back to front/front to back).

Table 11. BTU Details for C9500X switches with AC/ DC PSU

Total output BTU (Note: 1000 BTU/hr = 293W) - Model	C9K-PWR-1500WAC	C9K-PWR-1500WDC
C9500X-28C8D	4,034	4,034
C9500X-60L4D	3,412	3,412

Tables 12 and 13 provides more details on the Cisco Catalyst 9500 Series power supplies.

Table 12. C9500 Power supply specifications

Power supply feature	PWR-C4-950WAC-R	PWR-C4-950WDC-R	C9K-PWR-650WAC-R	C9K-PWR-650WACL-R	C9K-PWR-930WDC-R	C9K-PWR-1600WAC-R	C9K-PWR-1600WDC-R
Power max rating	950W	950W	650W	650W	930W	1600W	1600W
Input-voltage range and frequency	AC 90 to 264 VAC, 47 to 63 Hz	-36Vdc~ -72Vdc	AC 90VAC to 264VAC, 47 to 63 Hz	AC 90VAC to 264VAC, 47 to 63 Hz	DC -40VDC to -72VDC	AC 90VAC to 140VAC and 180VAC to 264VAC 47 to 63 Hz	DC -40VDC to -72VDC
Power supply efficiency	94%	91% at 48Vin, 50% load	94% (Typ)	94% (Typ)	92% (Typ)	94% (Typ)	92% (Typ)
Input current	AC 10A at 115VAC, 5 A at 230VAC	22.6A @ 48Vin, 950W	AC 6.8A Max at 115VAC, 3.4 A Max at 230VAC (when full loading)	AC 6.8A Max at 115VAC, 3.4 A Max at 230VAC (when full loading)	DC 23A max at -48VDC (when full loading)	AC 10.5A Max at 115VAC (1050W), 7.8 A Max at 230VAC (1600W)	DC 40A max at -48VDC (when full loading)
Output ratings	12V at 79A, 12V at 3A	950W	12Vmain at 54A, 12Vsb at 3A	12Vmain at 54A, 12Vsb at 3A	12Vmain at 54A, 12Vsb at 3A	12Vmain at 133A, 12Vsb at 3A	12Vmain at 133A, 12Vsb at 3A
Output holdup time	AC = 10 ms at maximum load	1ms	AC = 20 ms minimum for system	AC = 12 ms minimum at maximum load	AC = 8 ms minimum for system	AC = 20 ms minimum for system	AC = 5 ms minimum for system
Power-supply input receptacles	AC IEC 60320 C16		AC IEC 60320 C14	AC IEC 60320 C14	Molex Minifit 44540-1001	AC IEC 60320 C16	Amphenol C10-638976-000
Power cord rating	AC 15A	DC 40A	AC 10A	AC 10A	DC 40A	AC 15A	DC 70A

Table 13. BTU Details for 9500 Power Supplies (BTU/hr)

Total output BTU (Note: 1000 BTU/hr = 293W) - Model	C9K-PWR-1600WAC-R	C9K-PWR-1600WDC-R	C9K-PWR-650WAC-R	C9K-PWR-650WACL-R	C9K-PWR-930WDC-R	PWR-C4-950WAC-R	PWR-C4-950WDC-R
C9500-32C	3,631	3,709	N/A	N/A	N/A	N/A	N/A
C9500-32QC	N/A	N/A	1,815	1,815	1,856	N/A	N/A

Total output BTU (Note: 1000 BTU/hr = 293W) - Model	C9K-PWR-1600WAC-R	C9K-PWR-1600WDC-R	C9K-PWR-650WAC-R	C9K-PWR-650WACL-R	C9K-PWR-930WDC-R	PWR-C4-950WAC-R	PWR-C4-950WDC-R
C9500-48Y4C	N/A	N/A	1,856	1,856	1,856	N/A	N/A
C9500-24Y4C	N/A	N/A	1,454	1,454	1,484	N/A	N/A
C9500-16X with 10G NM	N/A	N/A		N/A	N/A	941	967
C9500-16X with 40G NM	N/A	N/A		N/A	N/A	904	930

Table 14 shows the power supplies supported in the Cisco Catalyst 9500 Series Switches.

Table 14. C9500 Power supply matrix

Model	C9K-PWR-1600WAC-R	C9K-PWR-1600WDC-R	C9K-PWR-650WAC-R	C9K-PWR-650WACL-R	C9K-PWR-930WDC-R	PWR-C4-950WAC-R	PWR-C4-950WDC-R
C9500-32C	Yes	Yes	No	No	No	No	No
C9500-32QC	No	No	Yes	Yes	Yes	No	No
C9500-48Y4C	No	No	Yes	Yes	Yes	No	No
C9500-24Y4C	No	No	Yes	Yes	Yes	No	No
C9500-16X	No	No	No	No	No	Yes	Yes

Table 15 shows key differences between C9K-PWR-650WAC-R and C9K-PWR-650WACL-R.

Table 15. Key differences between C9K-PWR-650WAC-R and C9K-PWR-650WACL-R

Criteria	C9K-PWR-650WAC-R	C9K-PWR-650WACL-R
IEC-61000-4-5 Surge	4KV CM, 2KV DM	2.5KV CM, 1KV DM
AC line Hold-up Time	>=20ms@90% load	>=12ms@100% load
OPP (Over Power Protection)	130% x rated load	140% x rated load

Switch performance

Table 16 shows performance specifications for the Cisco Catalyst 9500 Series Switches.

Table 16. Performance specifications

Performance numbers for all switch models	C9500-16X	C9500-32C	C9500-32QC	C9500-48Y4C	C9500-24Y4C	C9500X-28C8D	C9500X-60L4D
ASIC	**UADP 2.0**	**UADP 3.0**				**Q200**	
Switching capacity	Up to 480 Gbps	Up to 6.4 Tbps[2]	Up to 3.2 Tbps[2]	Up to 3.2 Tbps[2]	Up to 2.0 Tbps[2]	Up to 12 Tbps	Up to 9.2 Tbps
Forwarding rate	Up to 360 Mpps	Up to 2 Bpps	Up to 1 Bpps	Up to 1 Bpps	Up to 1 Bpps	8 Bpps	8 Bpps
Total MAC addresses	Up to 64,000[1]	Up to 82,000[1]				Up to 256,000[1]	
Total IPv4 routes (indirect routes)	Up to 64,000 indirect[1,6]	Up to 256,000 indirect + direct[1,6]				Up to 2,000,000[6]	
Total IPv4 host routes (direct routes and ARP)	Up to 80,000 host[1,6]	Up to 90,000 host/ARP[2,6]				Up to 256,000[1,6]	
Total IPv6 routes (indirect routes)	Up to 32,000 indirect[1,6]	Up to 256,000 indirect + direct[1,6]				Up to 1,000,000[6]	
Total IPv6 host routes (direct routes and NDP)	Up to 40,000 host[1,6]	Up to 90,000 host[1,6]				Up to 128,000[1,6]	
Total IPv4 Multicast routes	Up to 32,000[1,6]	Up to 32,000[1,6]				Up to 32,000[1,6]	
Total IPv6 Multicast routes	Up to 16,000[1,6]	Up to 32,000[1,6]				Up to 16,000[1,6]	
QoS ACL scale (v4/v6)	Up to 18,000/9,000[1]	Up to 16,000/8,000[1]				Up to 8,000/4,000[1,7]	
Security ACL scale (v4/v6)	Up to 18,000/9,000[1]	Up to 27,000/13,500[1]				Up to 8,000/4,000[1,7]	
FNF entries	Up to 512,000[1]	Up to 256,000[1]				Up to 2,000,000[5]	
DRAM	16 GB	16 GB				32 GB	
Flash	16 GB	16 GB				32 GB	
VLAN IDs	4,094	4,094				4,094	
PVST Instances	300[3]	4,000[1]				4,094	
STP Virtual Ports (Port* VLANs) for	13,000	16,000				16,000	

Performance numbers for all switch models	C9500-16X	C9500-32C	C9500-32QC	C9500-48Y4C	C9500-24Y4C	C9500X-28C8D	C9500X-60L4D
ASIC	**UADP 2.0**	**UADP 3.0**				**Q200**	
PVST							
STP Virtual Ports (Port* VLANs) for MST	13,000	100,000[4]				32,000	
Total Switched Virtual Interfaces (SVIs)	1,000	4,000[1]				3800	
Jumbo frame	9,198 bytes	9,216 bytes				9,216 bytes	

[1] Varies based on selected flexible ASIC template and platform.

[2] Line rate for 187byte packet size and above.

[3] 300 with IOS XE release 17.1.1 or later. 256 with IOS XE 16.12.x and 16.11.x 128 with IOS XE 16.10.x or earlier.

[4] 100,000 with IOSXE release 17.5.1 or later. With IOS XE 17.4.1 or earlier: 32,000 with C9500-32C and C9500-32QC; 52,000 with C9500-48Y4C; 28,000 with C9500-24Y4C.

[5] Flexible Netflow requires IOS XE release 17.8.1 or later.

[6] Table Maximum. The exact % of allocation will depend on specific IP/mask combinations.

[7] Table Maximum. Shared hardware resource. Maximum ACEs depends on number and type of ACLs configured across various interface types.

Important notes

Directly-connected (or host) IP routes mean any /32 or /128 routes, including those are learned indirectly (clients attached to switch's own VLAN/SVI and those /32 prefixes learned over any routing protocols, such as over OSPF.

Indirectly-connected (or advertised) IP routes are subnet routes with a prefix other than /32 or 128 (for example: /8, /16, /24, etc).

UADP 2.0 based C9500-16X supports 32,000 adjacency in hardware. So, they can support up to ~32,000 directly attached clients (including all adjacency) in their own VLAN/SVI.

UADP 3.0 based C9500-32C, 32QC, 24Y4C, and 48Y4C support 80,000 adjacency for SVI, with SDM template of distribution and 90,000 direct routes for all supported templates when a Layer 3 routed port is used.

In both UADP 3.0 and S1 Q200 models, the exact hardware programming (hash efficiency) of IP/mask entries depends on the specific number and type of IP/mask prefixes.

Flexible ASIC templates

Cisco Catalyst 9000 series switches use flexible Software Database Manager (SDM) ASIC templates to enable universal deployments by leveraging the UADP's ability to create resources to optimize table sizes for different places in the network. Based on how the switch is used in the network, an appropriate SDM ASIC template may be selected to configure the switch for specific features.

Catalyst 9500X models

Cisco Catalyst 9500X models support the following SDM ASIC templates

- Default (Core)
- Custom

Table 17 describes the default SDM ASIC template for C9500X models.

Table 17. SDM template descriptions for C9500X models

Features	Default Template
MAC Addresses	128,000
IP Host Routes[1]	128,000
IP LPM Routes[1,2]	2,000,000
IP Multicast Routes[1]	32,000
IGMP/MLD Snooping[1]	16,000
MPLS Labels[3]	256,000
Security/Object Groups	32,000
Security ACLs[1]	8,000
QoS ACLs[1]	8,000
PBR	16,000
GRE Tunnels	1,024
Sampled NetFlow entries[1]	2,000,000

[1] IPv4 and IPv6 entries coexist in the same tables, but IPv6 entries require two entries.

[2] LPM entries are stored as a hash and efficiency is dependent on the actual routes learnt. C9500X hashing efficiency has been improved in 17.12.2.

[3] Per-prefix MPLS labels are limited to 62,000 on C9500X.

Catalyst 9500 models

The following SDM ASIC templates are supported on the Cisco Catalyst 9500 Series.

- **Distribution:** Maximizes system resources for MAC and security.
- **Core:** Maximizes system resources for unicast and multicast routing.
- **SDA:** Maximizes system resources to support fabric deployment.
- **NAT:** Maximizes system resources for Layer 3 and NAT for support collapsed core WAN deployments.

Table 18 describes the standard SDM ASIC templates for C9500 models.

Table 18. SDM template descriptions for C9500 models

Template numbers for models C9500-32C, C9500-32QC, C9500-24Y4C, C9500-48Y4C	Distribution template	Core template (Default)	NAT template	SDA template[2]
IPv4/IPv6(LPM/Host)	114,000	212,000	212,000	212,000
Multicast route(IPv4/IPv6)	16,000	32,000	32,000	32,000
IGMP/MLD snooping	2,000	2,000	2,000	2,000
MAC addresses	82,000	32,000	32,000	32,000
MPLS/SGT label	**32,000**	**32,000**	**32,000**	**32,000**
NetFlow/ASIC	**98,000**	**64,000**	**64,000**	**64,000**
Security ACL	27,000[1]	27,000[1]	20,000[1]	27,000[1]
QoS ACL	16,000[1]	16,000[1]	8,000[1]	16,000[1]
PBR/NAT	3,000	3,000	15,500	2,000
Tunnel/MACsec	3,000	3,000	2,000	3,000
LISP	1,000	1,000	1,000	2,000
SPAN	1,000	1,000	1,000	1,000
STP Instances	1,000	1,000	1,000	1,000
Control Plane Policing (CoPP)	1,000	1,000	1,000	1,000
NetFlow ACL	1,000 ingress, 1,000 egress	1,000 ingress, 1,000 egress	1,000 ingress, 1,000 egress	1,000 ingress, 1,000 egress

Template numbers for models C9500-12Q, C9500-24Q, C9500-40X, C9500-16X	Distribution template (Default)	Core template	NAT template	SDA template[2]
IPv4/IPv6 LPM	64,000 / 32,000	64,000 / 32,000	64,000 / 32,000	64,000 / 32,000
IPv4/IPv6 host	48,000 / 24,000	32,000 / 16,000	48,000 / 24,000	80,000 / 40,000
IPv4/ IPv6 Multicast route	16,000 / 8,000	32,000 / 16,000	32,000 / 16,000	16,000 / 8,000
IGMP/MLD snooping	16,000	16,000	16,000	16,000
MAC address	64,000	16,000	16,000	16,000
SGT label	8,000	8,000	8,000	8,000
NetFlow/ASIC	128,000	128,000	128,000	128,000
Security ACL	18,000	18,000	18,000	18,000
QoS ACL	18,000	18,000	3000	18,000
PBR/NAT	2,000	2,000	16,000	2,000
Tunnel/MACsec	1,000	1,000	1,000	1,000
LISP	1,000	1,000	1,000	1,000
SPAN	1,000	1,000	1,000	1,000
STP instances	300[3]	300[3]	300[3]	300[3]
CoPP	1,000	1,000	1,000	1,000
NetFlow ACL	1,000 ingress, 2,000 egress	1,000 ingress, 2,000 egress	1,000 ingress, 2,000 egress	1,000 ingress, 2,000 egress

[1] ACL allocation is configurable between ingress, egress, IPv4 and non IPv4 (layer 2 and IPv6).

[2] SD-Access template has been removed from IOS XE 17.3.1 onwards (in lieu of Custom ASIC templates).

[3] 300 with IOS XE release 17.1.1 or later. 256 with IOS XE 16.12.x and 16.11.x 128 with IOS XE 16.10.x or earlier.

Custom ASIC templates

Catalyst 9500X Models (C9500X-28C8D and C9500X-60L4D)

Beginning with the Cisco IOS XE 17.7.1 release, a custom SDM template allows you to configure several features of the template based on your requirements and not the location of the device in the network.

Table 19. Custom template FIB configurable values

Features	Default Value	Scale Values (Min – Max)	Step Units
MAC Addresses	128,000	32,000[1] – 256,000	1,000
IPv4 Host Routes	32,000	32,000[1] – 256,000	1,000
IPv6 Host Routes	16,000	16,000[1] – 128,000	1,000
MPLS Labels[3]	256,000	0[2] – 512,000	1,000
Security/Object Groups	32,000	0[2] – 64,000	1,000
Total Resources	608,000		

[1] Critical features require a minimum allocation to insure operation. If a custom value if not defined, this value is used.

[2] Some (non-critical) features are allowed to have a 0 entry allocation, to allow increased allocation of other features.

[3] Per-prefix MPLS labels are limited to 62,000 on C9500X.

Learn more about configuring Custom SDM templates.

C9500-32C, C9500-32QC, C9500-24Y4C, C9500-48Y4C

Standard SDM templates can be used to configure system resources and optimize support for specific features. However SDM templates are defined based on how the device is deployed in the network.

Beginning with the Cisco IOS XE 17.3.1 release, a custom SDM template will allow you to configure the features of the template based on your requirements and not the location of the device in the network.

Table 20. Custom template configurable FIB values

Features	Scale Values (Min – Max)	Step Units	Default Value
MAC addresses	32,000 – 128,000	16,000	32,000
IPv4/IPv6 routes	64,000 – 256,000	16,000	64,000
Multicast routes[1]	0 – 32,000	16,000	16,000
IGMP/MLD Snooping[1]	0 – 32,000	16,000	16,000
SGT/MPLS labels[2]	0 – 64,000	32,000	32,000
Netflow entries – Input[3]	0 – 64,000	32,000	32,000
Netflow entries – Output[3]	0 – 64,000	32,000	0

Features	Scale Values (Min – Max)	Step Units	Default Value
Total Resources	416,000		

[1] Total Layer 2 and Layer 3 Multicast entries may not exceed 48,000.

[2] Each resource holds two SGT + MPLS entries.

[3] NetFlow entries require double entries.

Table 21. Custom template configurable ACL values

Features	Scale Values (Min – Max)	Step Units	Default Value
Security ACL – Input	4K–26K, 27K	2K	4K
Security ACL – Output	4K–26K, 27K	2K	4K
QoS ACL – Input	1K, 2K–16K	2K	1K
QoS ACL – Output	1K, 2K–16K	2K	1K
PBR/NAT	1K, 2K–16K	2K	2K
Netflow ACL	1K–2K	1K	1K
LISP	1K–2K	1K	1K
TUNNELS	1K–2K	1K	1K
Total Resources	**54k**		

Learn more about configuring Custom SDM templates.

Software requirements

The Cisco Catalyst 9500 Series Switches run on Cisco IOS XE Software version 16.5.1a or later. This software release includes all the features listed earlier in the Platform Benefits section. Table 22 lists the minimum software requirements for the switch models.

Table 22. Minimum software requirements

Model	Description	Minimum software requirement
C9500X-28C8D	Cisco Catalyst 9500X Switch with 28x 100G + 8x 400G Gigabit Ethernet	Cisco IOS XE Software Release 17.7.1
C9500X-60L4D	Cisco Catalyst 9500X Switch with 60x 50G + 4x 400G Gigabit Ethernet	Cisco IOS XE Software Release 17.10.1
C9500-32C	Cisco Catalyst 9500 Series 32-port 40/100 Gigabit Ethernet with QSFP+/QSFP28	Cisco IOS XE Software Release 16.8.1a
C9500-32QC	Cisco Catalyst 9500 Series 32-port 40 Gigabit Ethernet with QSFP+ / 16- port 100 Gigabit Ethernet with QSFP28	Cisco IOS XE Software Release 16.8.1a

Model	Description	Minimum software requirement
C9500-48Y4C	Cisco Catalyst 9500 Series high-performance 48-port 1/10/25G Gigabit Ethernet switch with SFP/SFP+/SFP28	Cisco IOS XE Software Release 16.8.1a
C9500-24Y4C	Cisco Catalyst 9500 Series high-performance 24-port 1/10/25G Gigabit Ethernet switch with SFP/SFP+/SFP28	Cisco IOS XE Software Release 16.8.1a
C9500-16X	Cisco Catalyst 9500 Series 16-port 1/10 Gigabit Ethernet with SFP/SFP+	Open Cisco IOS XE Software Release 16.8.1

Licensing

Introduction to Smart Licensing

Cisco Smart Licensing is a flexible licensing model that provides you with an easier, faster, and more consistent way to purchase and manage software across the Cisco portfolio and across your organization. And it's secure – you control what users can access. With Smart Licensing you get:

- **Easy Activation:** Smart Licensing establishes a pool of software licenses that can be used across the entire organization—no more PAKs (Product Activation Keys).
- **Unified Management:** My Cisco Entitlements (MCE) provides a complete view into all of your Cisco products and services in an easy-to-use portal, so you always know what you have and what you are using.
- **License Flexibility:** Your software is not node-locked to your hardware, so you can easily use and transfer licenses as needed.
- **Smart Licensing Using Policy (SLUP):** Enhanced version of Smart Licensing, with the overarching objective of providing a licensing solution that does not interrupt the operations of your network, rather, one that enables a compliance relationship to account for the hardware and software licenses you purchase and use.

To use Smart Licensing, you must first set up a Smart Account on Cisco Software Central (software.cisco.com).

For a more detailed overview on Cisco Licensing, go to cisco.com/go/licensingguide.

Software licenses

Table 23. Software licenses

	Cisco Catalyst Software Subscription new	Cisco DNA subscription	Network Advantage	Network Essentials
Packages[1]	3, 5 or 7 Year Terms	3, 5 or 7 Year Terms	Perpetual	Perpetual
Tiers	Advantage, Essentials	Advantage, Essentials	Advantage, Essentials	Advantage, Essentials
Portability[2]	✓	✓	✓	✓
Management options	Catalyst Center, Meraki Dashboard	Catalyst Center, Meraki Dashboard	CLI, Web UI	CLI, Web UI
Included support	Base product-level support for Hardware, Software and OS	Software support (SWSS)	X	X
Included[3] **add-ons: Common ISE policy, Thousand Eyes network and application assurance, Cisco Spaces**	X	X	X	X
Included ISE endpoint licenses	10	X	X	X

[1] For all new orders, subscription licenses are mandatory and must be of the same tier as network licenses

[2] Portability within the same Catalyst 9K series of hardware

[3] Only available with Advantage tier

Network Essentials and Advantage package features

Table 24. Network Essentials and Advantage package features

Features	Network Essentials	Network Advantage
Switch fundamentals Layer 2, Routed Access (RIP, EIGRP Stub, OSPF – Up to 1000 routes),PBR, PIM Stub Multicast (up to 1000 routes)), PVLAN[2], VRRP, PBR[3], CDP, QoS, FHS, 802.1x[2], Macsec-128, CoPP, SXP, IP SLA Responder, SSO	Yes	Yes
Advanced switch capabilities and scale BGP, EIGRP, HSRP, IS-IS, BSR, MSDP, PIM SM, PIM SSM, PIM-BIDIR[2], IP SLA, OSPF	No	Yes
Network segmentation VRF, VXLAN, LISP, BGP-EVPN[3], TrustSec/CMD[3], SGT, MPLS, mVPN[2]	No	Yes
Automation NETCONF, RESTCONF, gRPC, gNMI/gNOI, YANG, PnP Agent, ZTP/Open PnP,	Yes	Yes

Features	Network Essentials	Network Advantage
GuestShell (On-Box Python)		
Telemetry and visibility Model-driven telemetry, sampled NetFlow, SPAN, RSPAN[2]	Yes	Yes
High availability and resiliency GIR, NSF, ISSU[3], StackWise Virtual[3], SMU	No	Yes
IoT integration PTP[2] (IEEE1588v2)	No	Yes
Security MACsec-256, WAN MACsec[1, 4]	No	Yes
Cisco trustworthy solutions Trust Anchor module, Secure Boot, Image Signing, Modern Crypto, Runtime Defenses	Yes	Yes

Cisco Catalyst Essentials and Advantage package features

Table 25. Cisco Catalyst Essentials and Advantage package features

Features	Cisco Catalyst Essentials	Cisco Catalyst Advantage	Cisco DNA Essentials	Cisco DNA Advantage
Switch features				
Optimized network deployments Cisco Catalyst Service for Bonjour[3]	No	Yes	No	Yes
Advanced telemetry and visibility Flexible NetFlow[3], EEM	Yes	Yes	Yes	Yes
Optimized telemetry a visibility ERSPAN, App Hosting (in Containers/VMs), Wireshark	No	Yes	No	Yes
Cisco Catalyst Center features (formerly Cisco DNA Center)				
Simplified Campus Automation Simplified Campus Automation optimizes the discovery and configuration of devices in your network with a more streamlined simple and easy-to-use automation tool.	Yes	Yes	Yes	Yes
Day 0 network bring-up automation Cisco Network Plug-n-Play application, network settings, device credentials, LAN Automation, Host onboarding	Yes	Yes	Yes	Yes

Features	Cisco Catalyst Essentials	Cisco Catalyst Advantage	Cisco DNA Essentials	Cisco DNA Advantage
Element management Discovery, inventory, topology, software image, licensing, and configuration management	Yes	Yes	Yes	Yes
Element management Patch Management	No	Yes	No	Yes
Basic Assurance Health Dashboards – Network, Client, Application; Switch and Wired Client Health Monitoring	Yes	Yes	Yes	Yes
SD-Access Policy-based Automation and Assurance for Wired and Wireless	No	Yes	No	Yes
Embedded Wireless (with or w/o SD-Access)[2] Cisco Catalyst 9800 wireless software package to enable wireless controller functionality**	No	Yes	No	Yes
Network assurance and analytics Global Insights, Trends, Compliance, Custom Reports; Switch 360, Wired Client 360; Fabric and Non-Fabric Insights; App Health	No	Yes	No	Yes
Meraki Cloud Monitoring[2]	Yes* limited device visibility	Yes	Yes* limited device visibility	Yes

* Feature may be available in future software releases.

** Note: Purchase of Cisco Catalyst Advantage per access point is required to enable the wireless controller function on Catalyst switches.

[1] Not supported on C9500 UADP based models.

[2] Not supported on C9500X models.

[3] Supported in later IOSXE software versions. Refer to latest Catalyst 9500 Release Notes.

[4] Need to order HSEC Key.

For a full list of network stack features as well as Cisco Catalyst Advantage features, please visit: https://www.cisco.com/c/m/en_us/products/software/dna-subscription-switching/en-sw-sub-matrix-switching.html.

Managing licenses with Smart Accounts: Creating Smart Accounts by using the Cisco Smart Software Manager (SSM) enables you to manage your software licenses from a centralized website. You can set up Cisco SSM to receive daily email alerts and to be notified of expiring subscription licenses that you want to renew.

You must order a Cisco DNA or Cisco Catalyst subscription term license in order to purchase a Catalyst 9500 Series switch. When the license term expires, you can either renew the add-on license to continue using it or deactivate the add-on license and then reload the switch to continue operating with the base license capabilities.

Both the base and add-on licenses are also available for a 90-day evaluation period. An evaluation license is activated temporarily, without purchase. An expired evaluation license cannot be reactivated after reload.

Specifications

Dimensions, physical specifications and weight

Catalyst 9500X models

Table 26 lists the dimensions, specifications, weight and operating temperature for the Cisco Catalyst 9500X models.

Table 26. Dimensions, physical specifications, weight and operating temperature

Description	Specifications	
SKU	C9500X-28C8D	C9500X-60L4D
Dimensions (H x W x D)	H = 1.73” (4.39 cm) W = 17.5” (44.45 cm) D = 21.8” (55.37 cm) including Fan/Tray Handles	H = 1.73” (4.39 cm) W = 17.5” (44.45 cm) D = 21.8” (55.37 cm) including Fan/Tray Handles
Rack Units (RU)	1 RU	1RU
Chassis with 2 power supplies and built-In fan	29.27 lbs (13.28kg) Weights separated: Chassis = 22.13 lbs (10.04kg) Each Fan Tray = 0.26 lbs (0.12kg) AC PSU = 2.77 lbs (1.26kg) DC PSU = 2.71 lbs (1.23kg)	28.10 lbs (12.75kg) Weights separated: Chassis = 20.96 lbs (9.51kg) Each Fan Tray = 0.26 lbs (0.12kg) AC PSU = 2.77 lbs (1.26kg) DC PSU = 2.71 lbs (1.23kg)
Input voltage	See Table 4	
Operating temperature	-5° C to +45° C (23° to 113° F) sea level when using the C9500X-FAN-1U-R FAN. -5° C to +35° C (23° to 95° F) sea level when using the C9500X-FAN-1U-F FAN.	

Description	Specifications	
Altitude	If system is configured with a C9500X-FAN-1U-R fan: -5° C to +40° C (23° to 104 F) up to 6,000 feet (1800 m) -5° C to +35° C (23° to 95° F) up to 10,000 feet (3000 m) If system is configured with a C9500X-FAN-1U-F fan: -5° C to +30° C (23° to 86° F) up to 6,000 feet (1800 m) -5° C to +25° C (23° to 77° F) up to 10,000 feet (3000 m)	
Storage temperature	-40° C to 70° C (-40° to 158° F)	
Relative humidity operating and nonoperating (noncondensing)	Relative humidity operating: 10 to 85% (noncondensing) Relative humidity nonoperating: 0 to 95% (noncondensing)	

Catalyst 9500 models

Table 27 lists the dimensions, specifications, weight and operating temperature for the Cisco Catalyst 9500 models.

Table 27. Dimensions, physical specifications, weight and operating temperature

Description	Specifications				
SKU	C9500-32C	C9500-32QC	C9500- 48YC	C9500- 24YC	C9500-16X
Chassis with 2 power supplies and built-In fan	25.64 lbs (11.63 kg)	21.85 lbs (9.91 kg)	21.96 lbs (9.96 kg)	20.99 lbs (9.52 kg)	23.6 lbs (10.7 kg)
Dimensions (H x W x D)	1.73 x 17.5 x 21.2 in	1.73 x 17.5 x 18.0 in			1.73 x 17.5 x 21.52 in
Rack Units (RU)	1 RU				
Chassis with 2 power supplies and built-In fan	25.64 lb (11.63 kg)	21.85lLb (9.91 kg)	21.96 lb (9.96 kg)		23.6 lb (10.7 kg)
Input voltage	90 to 264 VAC*				
Operating temperature	32° to 104° F (0° to 40° C) up to altitude of 10,000 feet				
Altitude	Operation up to 10,000 feet at 40° C; up to 6,000 feet at 45° C				
Storage temperature	-4° to 149° F (-20° to 65° C)				
Relative humidity operating and nonoperating (noncondensing)	Ambient (noncondensing) operating: 5% to 90% Ambient (noncondensing) nonoperating and storage: 5% to 95%				
NEBS criteria levels	NEBS: • ETSI 300-019 Requirements are covered under GR-63-CORE with some deviations. • SR-3580 NEBS level 3 (GR-63-CORE, to current issue, GR-1089-CORE, to current issue)				

* Minimum input voltage is 90VAC, and maximum input voltage is 264VAC.

Mean-Time Between Failures (MTBF)

Catalyst 9500X models

Table 28 lists Mean-Time Between Failures (MTBF) for the Cisco Catalyst 9500X Switch and components.

Table 28. MTBF information

Model	MTBF (hours)
C9500X-28C8D	123,950
C9500X-60L4D	133,260
C9K-PWR-1500WAC	1,303,300
C9K-PWR-1500WDC	1,737,740
C9500X-FAN-1U-R	4,429,340
C9500X-FAN-1U-F	4,429,340

Catalyst 9500 models

Table 29 lists mean-time between failures (MTBF) for the Cisco Catalyst 9500 Series and components.

Table 29. MTBF information

Model	MTBF (hours)
C9500-32C	212,820
C9500-32QC	307,200
C9500-48Y4C	316,960
C9500-24Y4C	336,780
C9500-16X	315,790
PWR-C4-950WAC-R	2,268,760
PWR-C4-950WDC-R	2,559,000
C9K-PWR-650WAC-R	2,268,760
C9K-PWR-650WACL-R	1,229,043
C9K-PWR-930WDC-R	3,008,280
C9K-PWR-1600WAC-R	1,718,780
C9K-PWR-1600WDC-R	2,559,000
FAN-T4-R	5,710,990
C9K-T1-FANTRAY	3,035,430