Overview

The Cisco® Catalyst® 9300 Series Switches are Cisco's lead stackable enterprise switching platform built for security, IoT, mobility, and cloud. C9300-48U-E is 48- port UPOE, Network Essentials Switch of 9300 series. Catalyst 9300 Series are the next generation of the industry's most widely deployed switching platform. At 480 Gbps, they are the industry's highest-density stacking bandwidth solution with the most flexible uplink architecture. The Catalyst 9300 Series is the first optimized platform for high-density 802.11ac Wave2. It sets new maximums for network scale. These switches are also ready for the future, with an x86 CPU architecture and more memory, enabling them to host containers and run third-party applications and scripts natively within the switch.

Quick Specs

Figure 1 shows the appearance of the Cisco Catalyst C9300-48U-E.

Table 1 shows the Quick Spec of the C9300-48U-E.

Product Code	**C9300-48U-E.**
Product Description	Catalyst 9300 48-port UPOE, Network Essentials
Total 10/100/1000 or Multigigabit copper ports	48 Cisco UPOE
Default AC power supply	1100W AC
Available PoE power	822W
Dimensions(H×W×D)	4.4 x 44.5 × 40.9 cm
Weight	7.72 Kg

Product Details

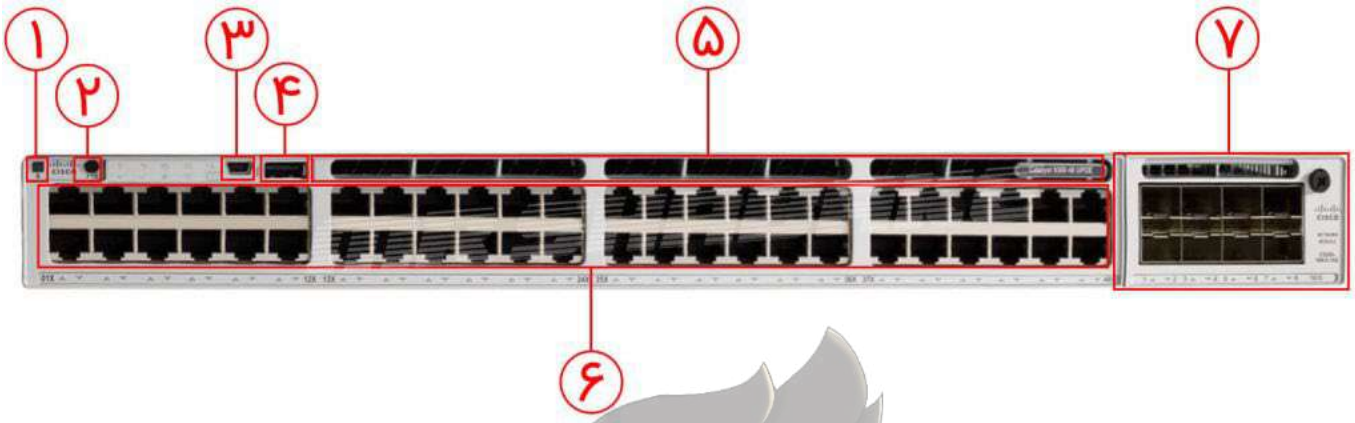

Figure 2 shows the front panel of the Cisco C9300-48U-E.

(1)	Mode button	(5)	Best HA-NSF/SSO
(2)	UID (blue beacon)	(6)	Catalyst 9300 48-port 1G copper with modular uplinks, UPOE, Network Essentials
(3)	USB mini-Type B (console) port	(7)	Modular Uplinks
(4)	USB Type A storage port		

·The status LEDs include STAT (status), DUPLX (duplex), SPEED, STACK, SYST (system), ACTV (active) and S-PWR (Stack Power).

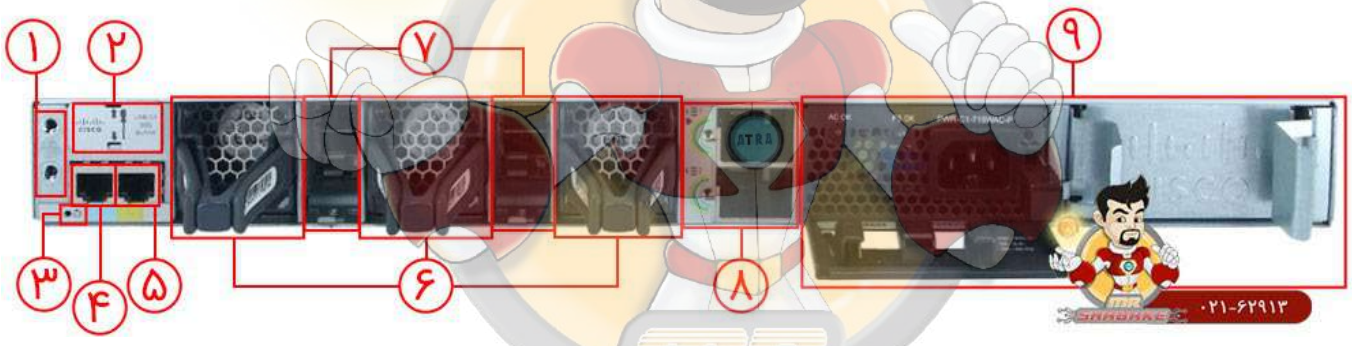

Figure 3 shows the back panel of the Cisco C9300-48U-E

(1)	Ground connectors	(6)	Fan module
(2)	USB3.0–SSD port	(7)	StackWise-480 port connectors
(3)	BEACON LED	(8)	StackPower connectors
(4)	CONSOLE (RJ-45 console port)	(9)	Power supply modules
(5)	MGMT (RJ-45 10/100/1000 management port)	-	-

● Highest wireless scale for Wi-Fi 6 and 802.11ac Wave 2 access points supported on a single switch with select models.

● Catalyst 9300 and Catalyst 9300L/LM models are based on the Cisco UADP 2.0 Application-Specific Integrated Circuit (ASIC) with programmable pipeline and micro-engine capabilities, along with template-based, configurable allocation of Layer 2 and Layer 3 forwarding, Access Control Lists (ACLs), and Quality of Service (QoS) entries.

● Catalyst 9300X models are based on UADP 2.0sec ASIC which adds line rate support for Crypto, including 100G hardware-based IPsec.

● x86 CPU complex with 8-GB memory, and 16 GB of flash and external USB 3.0 SSD pluggable storage slot (delivering up to 240GB of storage with an option SSD drive) to host containers. C9300X models support 16GB of memory.

● USB 2.0 slot to load system images and set configurations.

● Up to 1 TBps of local stackable switching bandwidth with Catalyst 9300X models.

● Deeper buffer and higher scale model options for rich multi-media content delivery applications.

● Flexible and dense uplink offerings with 100G, 40G, 25G, Multigigabit, 10G, and 1G as fixed or modular uplinks.

● Easy transition from 40G to 100G and 10G to 25G with dual-rate optics.

● Flexible downlink options with 25G, 10G and 1G Copper and Fiber as well as the densest Multigigabit links.

● With a mix of copper (1G up to 10G) and fiber (1G up to 25G) supported in a single stack, multiple flexible deployment scenarios are enabled, including 2-Tier, 3-Tier and Hybrid architectures.

● Leading PoE capabilities with up to 384 ports of PoE per stack, PoE+, and 288 ports high density IEEE 802.3bt - 90W UPOE+, and 60W Cisco UPOE.

● Intelligent Power Management with Cisco StackPower technology, providing power stacking among members for power redundancy. StackPower pools the power supplies across the stack to be used redundancy and supplemental power purposes.

● Line-rate, hardware-based Flexible NetFlow (FNF), delivering flow collection of up to 128,000 flows with select models.

● IPv6 support in hardware, providing wire-rate forwarding for IPv6 networks.

● Dual-stack support for IPv4/IPv6 and dynamic hardware forwarding table allocations, for ease of IPv4-to-IPv6 migration.

● Support for both static and dynamic NAT and Port Address Translation (PAT).

● IEEE 802.1ba AV Bridging (AVB) built in to provide a better audio and video 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 network.

● Cisco IOS XE, a modern operating system for the enterprise with support for model-driven programmability including NETCONF, RESTCONF, YANG, on-box Python scripting, streaming telemetry, container-based application hosting, and patching for critical bug fixes. The OS also has built-in defenses to protect against runtime attacks.

● End-to-end visualization of the path from campus/branch to clouds/DC with Cisco ThousandEyes Network and Application Synthetics (included with Cisco Catalyst and DNA Advantage license).

● Fully managed Meraki cloud customers are able to take advantage of power of Catalyst 9300 switching in their Meraki cloud through the cloud-management service.

● **SD-Access:** Cisco Catalyst 9300 Series switches form the foundational building block for SD-Access, Cisco's lead enterprise architecture:

◦ Policy-based automation from edge to cloud.

◦ Simplified segmentation and micro-segmentation, with predictable performance and scalability.

◦ Automation through Cisco Catalyst Center and Meraki Dashboard.

◦ Policy handled through the Cisco Identity Services Engine (ISE).

◦ Network assurance provided through the Cisco Catalyst Center and Meraki Dashboard.

◦ Faster launch of new business services and significantly improved issue resolution time.

● 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.

● Advanced security

◦ **Encrypted Traffic Analytics (ETA)**: You benefit from the power of machine learning to identify and take actions toward threats or anomalies in your network, including malware detection in encrypted traffic (without decryption) and distributed anomaly detection.

◦ Support for AES-256 with the powerful MACsec 256-bit encryption algorithm available on all models.

◦ **Trustworthy solutions:** Hardware anchored Secure Boot and Secure Unique Device Identification (SUDI) support for Plug and Play, to verify the identity of the hardware and software.

Network module numbers and descriptions

Network module	Description
C9300-NM-4G	Catalyst 9300 Series 4x 1G Network Module
C9300-NM-4M	Catalyst 9300 Series 4x Multigigabit Network Module
C9300-NM-8X	Catalyst 9300 Series 8x 10G/1G Network Module
C9300-NM-2Q	Catalyst 9300 Series 2x 40G Network Module
C9300-NM-2Y	Catalyst 9300 Series 2x 25G/10G/1G Network Module

*Please note: Catalyst 3850 and Catalyst 9300 network modules are supported on the Catalyst 9300 models. Catalyst 9300X network modules are only supported on the Catalyst 9300X models.

Stacking

● Cisco Catalyst 9300 Series switch models are designed for stacking switches as a single virtual switch, enabling customers to have a single management plane and control plane for up to 448 access ports.

● Mixed stacking between Catalyst 9300X and Catalyst 9300 models are supported at StackWise-480 speeds.

● Mixed stacking between Catalyst 9300 and Catalyst 9300X and Catalyst 9300 higher scale models (C9300-24UB, C9300-24UXB, C9300-48UB) is not supported. You cannot stack fixed uplink models (C9300L SKUs) with modular uplink models (C9300 SKUs) or other Catalyst switches, e.g. Cisco Catalyst 3850 and 3650 Series. Any combination of Catalyst 9300 models can form a stack. Separately, any combination of Catalyst 9300L models can form a stack.

● Catalyst 9300 higher scale SKUs (C9300-24UB, C9300-24UXB, C9300-48UB) need to be stacked with other higher scale models.

● StackWise cables that are available to configure stacking with Catalyst 9300 Series modular uplink models (C9300X and C9300 SKUs) come in lengths of 0.5m, 1m and 3m.

● The optional StackWise-320 kit for Catalyst 9300 Series fixed uplink models (C9300L and 9300LM SKUs) consists of two stack adapters and a stacking cable. The default stacking cable is 0.5 m, but options of 1m and 3m are also available. Table 6 lists the stacking accessories.

Stacking accessories

Model	Description
STACK-T1-50CM	Data stack 50 cm (cable option with C9300 and C9300X SKUs)
STACK-T1-1M	Data stack 1m (cable option with C9300 and C9300X SKUs)
STACK-T1-3M	Data stack 3m (cable option with C9300 and C9300X SKUs)
C9300L-STACK-KIT	Stack kit for C9300L SKUs only: Two data stack adapters and one data stack cable
STACK-T3-50CM	Data stack 50cm cable (default cable with C9300L Stack Kit)
STACK-T3-1M	Data stack 1m cable (cable option with C9300L Stack Kit)
STACK T3-3M	Data stack 3m cable (cable option with C9300L Stack Kit)
C9300L-STACK-KIT2	Stack kit for C9300LM and C9300L SKUs: Two data stack adapters and one data stack cable
STACK-T3A-50CM	Data stack 50cm cable (default cable with C9300L Stack Kit2)
STACK-T3A-1M	Data stack 1m cable (cable option with C9300L Stack Kit2)
STACK T3A-3M	Data stack 3m cable (cable option with C9300L Stack Kit2)

SD-Access architecture

What if you could give time back to IT? Provide network access in minutes for any user or device to any application – without compromise? SD-Access is the industry's first policy-based automation from network edge to cloud. Your foundation for your digital network, Cisco SD-Access. Built on the principles of the Cisco DNA, SD-Access provides end-to-end segmentation to keep user, device and application traffic separate without a redesign of the network. It automates user access policy so organizations can make sure the right policies are set for any user or device with any application across the network. This is accomplished with a single network fabric across LAN and WLAN which creates a consistent user experience anywhere without compromising on security.

There are many challenges today in managing the network to drive business outcomes. These limitations are due to manual configuration and fragmented tool offerings. SD-Access provides:

- A transformational management solution that reduces operational expenses and enhances business agility.
- Consistent management of wired and wireless network provisioning and policy.
- Automated network segmentation and group-based policy.
- Contextual insights for fast issue resolution and capacity planning.
- Open and programmable interfaces for integration with third-party solutions.

For an overview of key use-cases SD-Access addresses, refer to SD-Access Solution Overview

Multiprotocol label switching (MPLS)

The Cisco Catalyst 9300 Series Switches support Multiprotocol label switching (MPLS) which combines the performance and capabilities of Layer 2 (data link layer) switching with the proven scalability of Layer 3 (network layer) routing. MPLS enables the explosive growth in network utilization while providing the opportunity to differentiate services without sacrificing the existing network infrastructure. MPLS support includes

- MPLS L3 VPN: An MPLS Virtual Private Network (VPN) consists of a set of sites that are interconnected by means of a Multiprotocol Label Switching (MPLS) provider core network. At each customer site, one or more customer edge (CE) devices attach to one or more provider edge (PE) devices.
- VPLS: VPLS (Virtual Private LAN Service) enables enterprises to link together their Ethernet-based LANs from multiple sites via the infrastructure provided by their service provider.
- EoMPLS: EoMPLS is a category of Any Transport over MPLS (AToM) to transport Layer 2 packets over an MPLS backbone.
- MPLS over GRE: L3VPN over GRE and VPLS over GRE, are supported to tunnel MPLS/VPLS packets over non-MPLS networks utilizing GRE tunneling.

Power over Ethernet leadership

Cisco Universal Power over Ethernet (Cisco UPOE and Cisco UPOE+): PoE removes the need for wall sockets to power each PoE-enabled device and eliminates the cost of additional electrical cabling and circuits that would otherwise be necessary in IP phone and WLAN deployments. Cisco UPOE extends the IEEE PoE+ standard to double the power per port to 60 watts. This facilitates delivery of network power to a broad range of devices requiring higher power, including virtual desktop terminals, IP turrets, compact switches, building management gateways, LED lights, wireless access points, and IP phones. Designed for smart building and IoT applications, Cisco Catalyst 9300 UPOE+ switches (delivering PoE power up to 90W) provide data and power over a single cable to power devices like wireless access points, digital signage, security cameras, thermal cameras with PTZ features, LED lighting fixtures and large display screens. UPOE+ offers reduced cabling and installation costs without need for permits, device daisy-chaining application that require higher power draw, real-time device information, centralized management and remote control, faster and flexible device installation where devices can be positioned in a practical location instead of proximity to the electrical outlets.

Catalyst 9300 Series modular uplink (C9300 and C9300X SKUs) models support Cisco, Cisco UPOE, PoE+ and PoE, thereby addressing the largest range of network power needs.

Catalyst 9300 Series fixed uplink (C9300LM SKUs) models support Cisco UPOE or PoE+ and PoE.

Catalyst 9300 Series fixed uplink (C9300L SKUs) models support Cisco UPOE or PoE+ and PoE.

Power supply requirements for Catalyst 9300 Series modular uplink PoE/PoE+ models (C9300-xxP SKUs)

	24-port PoE switch	48-port PoE switch
PoE on all ports (15.4W per port)	1 PWR-C1-715WAC/PWR-C1-715WAC-P/PWR-C1-715WDC	1 PWR-C1-1100WAC/PWR-C1-1100WAC-P or 2 PWR-C1-715WAC/PWR-C1-715WAC-P/PWR-C1-715WDC
PoE+ on all ports (30W per port)	1 PWR-C1-1100WAC/PWR-C1-1100WAC-P or 2 PWR-C1-715WAC/PWR-C1-715WAC-P/PWR-C1-715WDC	2 PWR-C1-1100WAC/PWR-C1-1100WAC-P or 1 PWR-C1-1100WAC/PWR-C1-1100WAC-P and 1 PWR-C1-715WAC/PWR-C1-715WAC-P/PWR-C1-715WDC

Power supply requirements for Catalyst 9300 Series UPOE models (C9300-xxU/UB/UXM/UN, C9300L-xxUXG-xx SKUs)

	24-port Cisco UPOE switch	48-port Cisco UPOE switch	48 and 24-port Multigigabit Cisco UPOE switch*
Cisco UPOE (60W per port) & IEEE 802.3bt type3 on all ports (24-port switch) or up to 30 ports (48-port switch)	1 PWR-C1-1100WAC/PWR-C1-1100WAC-P and 1 PWR-C1-715WAC/PWR-C1-715WAC-P/PWR-C1-715WDC	2 PWR-C1-1100WAC/PWR-C1-1100WAC-P	2 PWR-C1-1100WAC/PWR-C1-1100WAC-P

- **Perpetual PoE:** With Perpetual PoE, the PoE power is maintained during a switch reload. This is important for IoT endpoints such as PoE-powered lights, so that there is no disruption during switch reboot.
- **Fast PoE:** When power is restored to a switch, PoE starts delivering power to endpoints without waiting for the operating system to fully load, thereby speeding up the time for the endpoint to start up.

Compare to Similar Items

Table 3 shows the comparison of similar items.

Models	C9300-48U-E	C9300-24P-A
Product Description	Catalyst 9300 48-port UPOE, Network Essentials	Catalyst 9300 24-port PoE+, Network Advantage
Total 10/100/1000 or Multigigabit copper ports	48 Cisco UPOE	24 POE+
Uplink Configuration	Modular Uplinks	Modular Uplinks
Default AC power supply	1100W AC	715W AC
Available PoE power	822W	445W
Dimensions (H x W x D)	1.73 x 17.5 x 17.5 Inches	1.73 x 17.5 x 17.5 Inches

The Accessories

Table 2 shows the recommended elements for the C9300-48U-E.

Product number	Description
C9300-NM-4G	9300 Series 4x 1G Network Module
C9300-NM-4G=	Catalyst 9300 4 x 1GE Network Module, spare
C9300-NM-8X	9300 Series 8x 10G Network Module
C9300-NM-8X=	Catalyst 9300 8 x 10GE Network Module, spare
C9300-NM-2Q	9300 Series 2x 40G Network Module
C9300-NM-2Q=	Catalyst 9300 2 x 40GE Network Module, spare
C9300-NM-4M	9300 Series 4x Multigigabit Network Module
C9300-NM-4M	Catalyst 9300 4 x MGig Network Module, spare

Specification

C9300-48U-E Specification	
enclosure type	Rack-mountable - 1U
Ports	48 x 10/100/1000 (UPOE)
Fans	Fan module
Switching Capacity	208Gbps
Software	Network Essentials
Maximum stacking number	8
Stack Bandwidth	480Gbps
Forwarding Performance	154.76 Mpps
FNF entries	64,000 flow on 24- and 48-port Gigabit Ethernet models
Maximum VLANs IDs	4096
MAC Address Table Size	32K
DRAM	8 GB
Flash Memory	16 GB
Total number of IPv4 routes (ARP plus learned routes)	32,000 (24,000 direct routes and 8000 indirect routes)
IPv6 routing entries	16,000
Multicast routing scale	8,000
QoS scale entries	5,120
ACL scale entries	5,120
Packet buffer per SKU	16 MB buffer for 24- or 48-port Gigabit Ethernet models 32 MB buffer for 24 and 48-port Multigigabit
Flexible NetFlow (FNF) entries	64,000 flows on 24- and 48-port Gigabit Ethernet models 128,000 flows on 24-port Multigigabit
Total Switched Virtual Interfaces (SVIs)	1000
Jumbo frames	9198 bytes
Total routed ports Catalyst per 9300 Series stack	448
Wireless bandwidth per switch	Up to 96 Gbps on 48-port Gigabit Ethernet model
Mean time between failures – MTBF (hours)	299,000
Expansion / Connectivity	
Console ports	USB (Type-B), Ethernet (RJ-45)
Expansion Slot(s)	1 power redundant slot
Power supply	PWR-C5-715WAC
Power Redundancy	optional
Voltage range (Auto)	100V-240V

Miscellaneous	
Width	17.5 Inches (44.4 cm)
Depth	17.7 Inches (44.9 cm)
Height	1.73 Inches (4.3 cm)
Weight	16.84 Pounds (7.64 Kg)
Rack Mounting Kit	optional
MTBF in hours	299,000
Compliant Standards	IEEE 802.1s IEEE 802.1w IEEE 802.1x IEEE 802.1x-Rev IEEE 802.3ad IEEE 802.3ae IEEE 802.3af IEEE 802.3at IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports IEEE 802.1D Spanning Tree Protocol IEEE 802.1p CoS prioritization IEEE 802.1Q VLAN IEEE 802.3 10BASE-T specification IEEE 802.3u 100BASE-TX specification IEEE 802.3ab 1000BASE-T specification IEEE 802.3z 1000BASE-X specification IEEE 802.3bz Multirate 2.5G/5G specification IEEE 802.3an 10G BASE-T specification RMON I and II standards SNMPv1, v2c, and v3
Management	BRIDGE-MIBCISCO-BRIDGE-EXT-MIB CISCO-BULK-FILE-MIB CISCO-CABLE-DIAG-MIB CISCO-CALLHOME-MIB CISCO-CEF-MIB CISCO-CIRCUIT-INTERFACE-MIB CISCO-CONFIG-COPY-MIB CISCO-CONFIG-MAN-MIB CISCO-DEVICE-LOCATION-MIB CISCO-DHCP-SNOOPING-MIB CISCO-EIGRP-MIB CISCO-EMBEDDED-EVENT-MGR-MIB CISCO-ENTITY-FRU-CONTROL-MIB CISCO-ENTITY-SENSOR-MIB CISCO-ENTITY-VENDORTYPE-OID-MIB CISCO-ERR-DISABLE-MIB CISCO-FLASH-MIB CISCO-FLOW-MONITOR-MIB CISCO-FTP-CLIENT-MIB CISCO-HSRP-EXT-MIB CISCO-HSRP-MIB CISCO-IETF-BFD-MIB CISCO-IETF-PPVPN-MPLS-VPN-MIB CISCO-IETF-PW-MPLS-MIB CISCO-IF-EXTENSION-MIB CISCO-IGMP-FILTER-MIB CISCO-IMAGE-LICENSE-MGMT-MIB CISCO-IMAGE-MIB CISCO-IP-CBR-METRICS-MIB CISCO-IP-STAT-MIB CISCO-IP-TAP-MIB CISCO-IP-URPF-MIB CISCO-IPSEC-FLOW-MONITOR-MIB CISCO-IPSEC-MIB CISCO-IPSEC-PROVISIONING-MIB CISCO-IPSLA-AUTOMEASURE-MIB CISCO-IPSLA-ECHO-MIB CISCO-IPSLA-JITTER-MIB CISCO-L2-CONTROL-MIB CISCO-L2L3-INTERFACE-CONFIG-MIB CISCO-LAG-MIB

	CISCO-LICENSE-MGMT-MIB CISCO-LOCAL-AUTH-USER-MIB CISCO-MAC-NOTIFICATION-MIB CISCO-MDI-METRICS-MIB CISCO-MEDIA-METRICS-MIB CISCO-MEMORY-POOL-MIB CISCO-MPLS-LSR-EXT-STD-MIB CISCO-NBAR-PROTOCOL-DISCOVERY-MIB CISCO-NHRP-EXT-MIB CISCO-NTP-MIB CISCO-PAGP-MIB CISCO-PORT-SECURITY-MIB CISCO-PORT-STORM-CONTROL-MIB CISCO-POWER-ETHERNET-EXT-MIB CISCO-PRIVATE-VLAN-MIB CISCO-PROCESS-MIB CISCO-PRODUCTS-MIB CISCO-RF-MIB CISCO-RTP-METRICS-MIB CISCO-RTTMON-ICMP-MIB CISCO-STACKWISE-MIB CISCO-STP-EXTENSIONS-MIB CISCO-SYSLOG-MIB CISCO-TCP-MIB CISCO-UDLDP-MIB CISCO-VLAN-IFTABLE-RELATIONSHIP-MIB ENTITY-MIB HC-ALARM-MIB HC-RMON-MIB IEEE8023-LAG-MIB IF-MIB IP-FORWARD-MIB IP-MIB LLDP-EXT-MED-MIB LLDP-MIB MAU-MIB MPLS-L3VPN-STD-MIB MPLS-LSR-STD-MIB MPLS-VPN-MIB OLD-CISCO-CHASSIS-MIB OLD-CISCO-CPU-MIB OLD-CISCO-INTERFACES-MIB OLD-CISCO-IP-MIB OLD-CISCO-MEMORY-MIB OLD-CISCO-SYS-MIB OLD-CISCO-TCP-MIB OLD-CISCO-TS-MIB POWER-ETHERNET-MIB RFC1213-MIB RMON-MIB RMON2-MIB SMON-MIB SNMPv2-MIB SONET-MIB TCP-MIB UDP-MIB
Environmental Ranges	
Acoustic noise	**Measured per ISO 7779 and declared per ISO 9296** **Bystander positions operating to an ambient temperature of 25°C**
	With AC power supply (with 24 PoE+ ports loaded for C9300 SKUs) ● LpA: 45dB typical, 48 dB max ● LwA: 5.6B typical, 5.9B max With AC power supply (with half the number of PoE+ ports loaded for C9300L SKUs) ● LpA: 44dB typical, 47 dB max ● LwA: 5.5B typical, 5.8B max Typical: Noise emission for a typical configuration Maximum: Statistical maximum to account for variation in production
Connectors and cabling	● 1000BASE-T ports: RJ-45 connectors, 4-pair Cat 5E UTP cabling ● Multigigabit-T ports: RJ-45 connectors, 4-pair Cat 5E, Cat 6, Cat 6A UTP cabling ● 1000BASE-T SFP-based ports: RJ-45 connectors, 4-pair Cat 5E UTP cabling

	• SFP transceivers: LC fiber connectors (single-mode or multimode fiber) • SFP+ transceivers: LC fiber connectors (single-mode or multimode fiber) • QSFP+ transceivers: MPO and LC fiber connectors (single-mode or multimode fiber) • QSFP+ connector • SFP+ connector • Cisco StackWise stacking ports: copper-based Cisco StackWise cabling • Cisco StackPower: Cisco proprietary power stacking cables • Ethernet management port: RJ-45 connectors, 4-pair Cat 5 UTP cabling • Management console port: RJ-45-to-DB9 cable for PC connections

مقالات مرتبط :

- کانفینگ سوئیچ سیسکو
- راهنمای خرید سوئیچ های سیسکو 9300 (قسمت اول)
- بررسی سوئیچ های سیسکو سری 9000
- سوئیچ سیسکو در دیتاسنتر
- انواع سیستم عامل سوئیچ سیسکو
- بررسی سیسکو SD-Access
- مدل OSI چیست؟ تفاوت مدل OSI و TCP/IP و بررسی کامل
- سوئیچ سیسکو Meraki چیست