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Cisco Catalyst 9400 Supervisor Engine Modules

Contents

Product overview

Cisco® Catalyst® 9400 Series switches are Cisco's lead modular enterprise access 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.

The Catalyst 9400 Series, including the new Catalyst 9400 SUP-2/2XL supervisor and line cards, 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. These switches form the foundational building blocks for Cisco SD-Access, our leading enterprise architecture. The platform provides strong investment protection, with a chassis architecture that is capable of supporting up to nine Tbps of system bandwidth and industry-leading power delivery with high-density IEEE 802.3bt PoE (60W and 90W). Redundancy is now available across the portfolio. Cisco Catalyst 9400 Series switches deliver state-of-the-art high availability with capabilities such as Nonstop Forwarding and Stateful Switchover (NSF/SSO), In-Service Software Upgrade (ISSU), uplink resiliency, and N+1/N+N redundancy for power supplies and Cisco StackWise® Virtual (SVL) redundancy with ISSU. The platform is enterprise-optimized with an innovative, dual-serviceable fan-tray design and side-to-side airflow and is closet-friendly with approximately 16 inches in depth. A single system can scale up to 480G per slot with SUP-2XL, 384 access ports with your choice of 10G, 5G and 2.5G mGig copper, 1G copper, Cisco UPOE®+, Cisco UPOE and PoE+ options and up to 384 ports of 10G Fiber and 1G Fiber options. The platform also supports 100G/40G/25G/10G uplink options and advanced routing and infrastructure services, SD-Access capabilities, and network system virtualization. These features enable placement of the platform in the core and aggregation layers of small- to medium-sized campus environments.

A foundation for Software-Defined Architecture

Advanced persistent security threats, the exponential growth of the Internet of Things (IoT) devices, mobility everywhere and cloud adoption require a network fabric that integrates advanced hardware and software innovations to automate, secure, and simplify customer networks. The goal of this network fabric is to enable customer revenue growth by accelerating business service rollout.

The Cisco Networking Cloud with Software-Defined Access (SD-Access) is the most advanced network fabric to power customer business. Cisco Networking Cloud is an open and extensible, software-driven architecture that accelerates and simplifies your enterprise network operations. The programmable architecture frees your IT staff from time consuming, repetitive network configuration tasks so they can focus instead on innovation that positively transforms your business. SD-Access enables policy-based automation from edge to cloud with foundational capabilities that include:

- Simplified device deployment
- Unified management of wired and wireless networks
- Network virtualization and segmentation
- Group-based policies
- Context-based analytics

Cisco Catalyst 9400 Series switches support enterprise fabric to provide these benefits, while extending controller-based networking with uniform enterprise-wide policy and mobility.

Software subscription

There are two choices for software subscription: Cisco DNA or Cisco Catalyst. They provide:

- Flexible licensing models to smoothly distribute customers' software spending over time.

- Investment protection for software purchases through software services–enabled license portability.

- Access to updates, upgrades, and new technology from Cisco through Cisco Software Support Services (SWSS).

- Base product-level support for hardware, software, and Cisco IOS (Catalyst Software only).

- ISE licenses included in the Advantage tier to facilitate zero-trust network security* (Catalyst Software only).

- Access to end-to-end network visibility with Cisco Spaces and service assurance through Cisco ThousandEyes Network and Application Synthetics (included with the Advantage license).

Manage your entire switching structure as a single, converged component. With one management system and one policy for wired and wireless networks, it offers an efficient way to provide more secure access.

*ISE license quantities are outlined below. Note that ISE is not eligible for Catalyst 9200 series switches.

ISE license quantities in Cisco Catalyst software subscription for Switching.

Eligible product families*	Cisco Catalyst 9600 Series	Cisco Catalyst 9500 Series	Cisco Catalyst 9400 Series	Cisco Catalyst 9300 Series
ISE quantity per Advantage license	40 endpoint sessions for ISE	10 endpoint sessions for ISE	40 endpoint sessions for ISE	10 endpoint sessions for ISE

Cisco Spaces and ThousandEyes

Cisco Catalyst 9400 Series switches support hosting Cisco Spaces natively on the CPU complex. Cisco Spaces IoT Services on Catalyst 9000 switches bridges wired smart building technology using the power of data to help speed return to a trusted workplace and the inevitable return-to-office.

Cisco Spaces is included with Cisco DNA Advantage licenses.

Access to end-to-end service assurance through Cisco ThousandEyes* Network and Application Synthetics (included with Cisco DNA Advantage licenses).

Cisco Networking Cloud lets you manage your entire switching structure as a single, converged component. With one management system and one policy for wired and wireless networks, it offers an efficient way to provide more secure access.

* The ThousandEyes credits included as part of Catalyst 9400 Cisco DNA Advantage subscriptions will be limited to 110,000,000 units of test capacity per customer. ThousandEyes Cloud Agent access is not included in the Cisco DNA license entitlement. Test capacity can be increased and Cloud Agents accessed with purchase of additional ThousandEyes Network and Application Synthetics.

Details

Cisco Catalyst 9400 Series switches support five supervisors optimized for various campus deployments – access and aggregation. Along with [Cisco's campus-optimized 100G and 25G optics](#), these modular platforms are now capable of supporting architectural transformations with industry-leading investment protection.

The Cisco Catalyst C9400X-SUP-2XL supervisor engine is designed for the core and aggregation with 100G uplinks (Figure 1).

Figure 1.
C9400X-SUP-2XL supervisor engine

The Cisco Catalyst C9400X-SUP-2XL supervisor engine is a next-generation supervisor optimized for the enterprise-class core and aggregation layers, supporting up to 480 Gbps per slot with 100G uplinks. Supervisor Engine-2XL allows for unique investment protection through a 100G uplink connectivity option, which is becoming a popular alternative to 40G in the core.

The Cisco Catalyst C9400X-SUP-2XL supervisor engine hardware is capable of supporting advanced routing and infrastructure services such as Multiprotocol Label Switching (MPLS); software-defined access control and border capabilities (such as a host-tracking database, cross-domain connectivity, and VPN Routing and Forwarding [VRF]-aware Locator/ID Separation Protocol [LISP]); and hardware capable flexible ASIC templates to create resources to optimize table sizes for different places in the network.

The Cisco Catalyst C9400X-SUP-2 supervisor engine is designed for the Access with 100G uplinks (Figure 2).

Figure 2.
C9400X-SUP-2 supervisor engine

The Cisco Catalyst C9400X-SUP-2 supervisor engine is a next-generation supervisor optimized for the enterprise-class access layers, supporting up to 240 Gbps per slot with 100G uplinks.

The Cisco Catalyst C9400-SUP-1XL-Y supervisor engine is designed for the core and aggregation with 25G uplinks (Figure 3).

Figure 3.
C9400-SUP-1XL-Y supervisor engine

The Cisco Catalyst C9400-SUP-1XL-Y supervisor engine is a next-generation supervisor optimized for the enterprise-class core and aggregation layers, supporting up to 240 Gbps per slot with 25G uplinks. Supervisor Engine-1XL-Y allows for unique investment protection through a 25G uplink connectivity option, which is becoming a popular alternative to 10G in the core. The Cisco Catalyst C9400-SUP-1XL-Y supervisor engine hardware is capable of supporting advanced routing and infrastructure services such as Multiprotocol Label Switching (MPLS); software-defined access control and border capabilities (such as a host-tracking database, cross-domain connectivity, and VPN Routing and Forwarding [VRF]-aware Locator/ID Separation Protocol [LISP]); and flexible ASIC templates to create resources to optimize table sizes for different places in the network.

The Catalyst C9400-SUP-1XL supervisor engine is designed for the core and aggregation layers (Figure 4).

Figure 4.
C9400-SUP-1XL supervisor engine

The Cisco Catalyst C9400-SUP-1XL supervisor engine is a next-generation supervisor optimized for enterprise-class the core and aggregation layers, supporting up to 240 Gbps. The C9400-SUP-1XL supervisor engine hardware is capable of supporting advanced routing and infrastructure services such as Multiprotocol Label Switching (MPLS); software-defined access control and border capabilities (such as a host tracking database, cross-domain connectivity, and VPN routing and forwarding [VRF]-aware Locator/ID Separation Protocol [LISP]); flexible ASIC templates to create resources to optimize table sizes for different places in the network; and network system virtualization with Cisco StackWise Virtual technology, which is critical for placement in the campus core.

The Cisco Catalyst C9400-SUP-1 supervisor engine is designed for access (Figure 5).

Figure 5.
C9400-SUP-1 supervisor engine

Features

Product highlights

- The Cisco Unified Access Data Plane (UADP) 3.0sec ASIC on C9400X-SUP-2XL, C9400X-SUP-2 and Cisco Unified Access Data Plane (UADP) 2.0 ASIC on C9400-SUP-1/1XL/1XL-Y is ready for next-generation technologies with its programmable pipeline, microengine capabilities, and template-based configurable allocation of Layer 2, Layer 3, forwarding, Access Control List (ACL), and Quality of Service (QoS) entries.

- Intel 2.4-GHz x86 with up to 960 GB of SATA SSD local storage for container-based application hosting.

- Up to 4 non-blocking 100/40 Gigabit Ethernet uplinks and up to 4 non-blocking 25/10 Gigabit Ethernet uplinks on Supervisor-2/2XL.

- Up to 2 non-blocking 25 Gigabit Ethernet uplinks on the C9400-SUP-1XL-Y supervisor engine.

- Up to 2 non-blocking 40 Gigabit Ethernet uplinks (Quad Small Form-Factor Pluggable [QSFP]) and up to 8 non-blocking 10 Gigabit Ethernet uplinks (SFP+) on Supervisor-1/1XL/1XL-Y.

- Up to 384 ports of non-blocking 10/100/1000 RJ-45 ports.

- Up to 392 ports of non-blocking 1 Gigabit Ethernet Fiber (SFP) ports (Sup1/1XL/XL-Y). 384 ports of non- blocking 1Gigabit Ethernet Fiber (SFP) ports (SUP2/2XL).

- Up to 392 ports of non-blocking 10 Gigabit Ethernet SFP+ ports (8 uplinks plus 384 10G line card ports) (Sup1/1XL/XL-Y); 388 ports of non-blocking 10 Gigabit Ethernet SFP+ ports (4 uplinks plus 384 10G line cards ports) (SUP2/2XL).

- Up to 168 ports of 25 Gigabit Ethernet SFP28 ports (8 uplinks plus 160 25G line cards ports) (SUP2/2XL).

- Up to 36 ports of 100 Gigabit Ethernet QSFP28 ports (4 100G uplinks plus 32 100G line cards ports) (SUP2/2XL).

- Up to 384 ports of non-blocking 10G/5G mGig RJ-45 ports.

- Cisco UPOE+ (90 W), Cisco UPOE (60W), and PoE+ (30W) capabilities on 384 ports simultaneously.

- Line rate hardware-based Flexible NetFlow (FNF) delivering flow collection up to 384,000 flows.

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

- Dual-stack support for IPv4 and 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).

- Scalable routing (IPv4, IPv6, and multicast) tables and Layer 2 tables.

- Open 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. The OS also has built-in defenses to protect against runtime attacks.

- Support app hosted Cisco Spaces natively on the CPU complex. Cisco Spaces IoT Services on Catalyst 9000 switches bridges wired smart building technology using the power of data to help speed return to a trusted workplace and the inevitable return-to-office.

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

- **SD-Access:** Cisco Catalyst 9400 Series Switches form the foundation building block for SD-Access – Cisco's leading enterprise architecture, which includes:

  ○ Policy-based automation from edge to cloud.

  ○ Segmentation and micro-segmentation made easy, with having predictable performance and scalability.

  ○ Automation through Cisco DNA Center™

  ○ Policy through the Cisco Identity Services Engine (ISE).

  ○ Network assurance through Network Data Platform.

  ○ The ability to launch new business services faster and improve issue resolution time significantly.

- Plug and Play (PnP) enabled: A simple, secure, unified, and integrated offering eases new branch or campus device rollouts and can also be used for providing updates to an existing network.

Advanced security

- Cisco Encrypted Traffic Analytics (ETA)[1]: 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.

- AES-256[2] support with the powerful MACsec-256 encryption algorithm is available in hardware.

- Trustworthy systems: Secure Unique Device Identification (SUDI) support for PnP tamper-proof device identity capability secures zero-touch provisioning by allowing your device to show a certificate to the server to be able to get onto your network.

[1] ETA is currently not supported in C9400X-SUP-2/2XL.

[2] MACsec is currently not supported in hardware in the C9400-SUP-1XL-Y supervisor engine.

Supervisor Engine Chassis and Line Card Support

Table 1 shows the supervisor engine and line card slot assignment options in the Cisco Catalyst 9400 Series chassis.

Table 1.   Cisco Catalyst 9400 Chassis Slot: Assignment Options

Chassis model	Single Supervisor Engine slot assignments	Redundant Supervisor Engine slot assignments	Line card slot options
C9404R	Slots 2 or 3	Slots 2 or 3	Slots 1 and 4
C9407R	Slots 3 or 4	Slots 3 or 4	Slots 1, 2, and 5 to 7
C9410R	Slots 5 or 6	Slots 5 or 6	Slots 1 to 4, and 7 to 10

Table 2.   Cisco Catalyst 9400 Chassis Minimum Software Support

Chassis model	C9400-SUP-1 minimum software	C9400-SUP-1XL minimum software	C9400-SUP-1XL-Y minimum software	C9400X-SUP-2 minimum software	C9400X-SUP-2XL minimum software
C9404R	Cisco IOS XE 16.9.1	Cisco IOS XE 16.9.1	Cisco IOS XE 16.9.1	Cisco IOS XE 17.7.1	Cisco IOS XE 17.7.1
C9407R	Cisco IOS XE 16.6.1	Cisco IOS XE 16.6.2	Cisco IOS XE 16.9.1	Cisco IOS XE 17.7.1	Cisco IOS XE 17.7.1
C9410R	Cisco IOS XE 16.6.1	Cisco IOS XE 16.6.2	Cisco IOS XE 16.9.1	Cisco IOS XE 17.7.1	Cisco IOS XE 17.7.1

Table 3 summarizes the performance capacities of the Supervisor Engine on a per-chassis basis.

Table 3.   Cisco Catalyst 9400 Supervisor Engine Bandwidth per Slot for Different Chassis

	C9404R chassis	C9407R chassis	C9410R chassis
C9400-SUP-1	80 Gbps per slot	80 Gbps per slot	80 Gbps per slot
C9400-SUP-1XL	240 Gbps per slot	120 Gbps per slot	80 Gbps per slot
C9400-SUP-1XL-Y	240 Gbps per slot	120 Gbps per slot	80 Gbps per slot
C9400X-SUP-2	240 Gbps per slot	240 Gbps per slot	240 Gbps per slot
C9400X-SUP-2XL	480 Gbps per slot	480 Gbps per slot	480 Gbps per slot

Table 4 summarizes the line card modules supported on Supervisor Engine.

Table 4. Cisco Catalyst 9400 Supervisor Engine Line Card and Module Support

Supervisor Engine	Line card	Description	Minimum software
C9400-SUP-1	C9400-LC-48U	Cisco Catalyst 9400 Series 48-Port UPOE 10/100/1000 (RJ-45)	Cisco IOS XE 16.6.1
	C9400-LC-48T	Cisco Catalyst 9400 Series 48-Port 10/100/1000 (RJ-45)	Cisco IOS XE 16.6.1
	C9400-LC-48UX	Cisco Catalyst 9400 Series 48-Port UPOE with 24p mGig 24p RJ-45	Cisco IOS XE 16.6.2
	C9400-LC-24XS	Cisco Catalyst 9400 Series 24-Port 10 Gigabit Ethernet (SFP+)	Cisco IOS XE 16.6.2
	C9400-LC-48P	Cisco Catalyst 9400 Series 48-Port POE+ 10/100/1000 (RJ-45)	Cisco IOS XE 16.8.1
	C9400-LC-24S	Cisco Catalyst 9400 Series 24-Port Gigabit Ethernet (SFP)	Cisco IOS XE 16.8.1
	C9400-LC-48S	Cisco Catalyst 9400 Series 48-Port Gigabit Ethernet (SFP)	Cisco IOS XE 16.8.1
	C9400-LC-48H	Cisco Catalyst 9400 Series 48-Port UPOE+ 10/100/1000 (RJ-45)	Cisco IOS XE 16.12.1
	C9400-LC-48HN	Cisco Catalyst 9400 Series 48-Port 5G multigigabit w/ full 90W UPOE+	Cisco IOS XE 17.5.1
C9400-SUP-1XL	C9400-LC-48U	Cisco Catalyst 9400 Series 48-Port UPOE 10/100/1000 (RJ-45)	Cisco IOS XE 16.6.2
	C9400-LC-48T	Cisco Catalyst 9400 Series 48-Port 10/100/1000 (RJ-45)	Cisco IOS XE 16.6.2
	C9400-LC-48UX	Cisco Catalyst 9400 Series 48-Port UPOE with 24p mGig 24p RJ-45	Cisco IOS XE 16.6.2
	C9400-LC-24XS	Cisco Catalyst 9400 Series 24-Port 10 Gigabit Ethernet (SFP+)	Cisco IOS XE 16.6.2
	C9400-LC-48P	Cisco Catalyst 9400 Series 48-Port POE+ 10/100/1000 (RJ-45)	Cisco IOS XE 16.8.1
	C9400-LC-24S	Cisco Catalyst 9400 Series 24-Port Gigabit Ethernet (SFP)	Cisco IOS XE 16.8.1
	C9400-LC-48S	Cisco Catalyst 9400 Series 48-Port Gigabit Ethernet (SFP)	Cisco IOS XE 16.8.1
	C9400-LC-48H	Cisco Catalyst 9400 Series 48-Port UPOE+ 10/100/1000 (RJ-45)	Cisco IOS XE 16.12.1
	C9400-LC-48HN	Cisco Catalyst 9400 Series 48-Port 5G multiGigabit w/ full 90W UPOE+	Cisco IOS XE 17.5.1

Supervisor Engine	Line card	Description	Minimum software
C9400-SUP-1XL-Y	C9400-LC-48U	Cisco Catalyst 9400 Series 48-Port UPOE 10/100/1000 (RJ-45)	Cisco IOS XE 16.9.1
	C9400-LC-48T	Cisco Catalyst 9400 Series 48-Port 10/100/1000 (RJ-45)	Cisco IOS XE 16.9.1
	C9400-LC-48UX	Cisco Catalyst 9400 Series 48-Port UPOE with 24p mGig 24p RJ-45	Cisco IOS XE 16.9.1
	C9400-LC-24XS	Cisco Catalyst 9400 Series 24-Port 10 Gigabit Ethernet (SFP+)	Cisco IOS XE 16.9.1
	C9400-LC-48P	Cisco Catalyst 9400 Series 48-Port POE+ 10/100/1000 (RJ-45)	Cisco IOS XE 16.9.1
	C9400-LC-24S	Cisco Catalyst 9400 Series 24-Port Gigabit Ethernet (SFP)	Cisco IOS XE 16.9.1
	C9400-LC-48S	Cisco Catalyst 9400 Series 48-Port Gigabit Ethernet (SFP)	Cisco IOS XE 16.9.1
	C9400-LC-48H	Cisco Catalyst 9400 Series 48-Port UPOE+ 10/100/1000 (RJ-45)	Cisco IOS XE 16.12.1
	C9400-LC-48HN	Cisco Catalyst 9400 Series 48-Port 5G multiGigabit w/ full 90W UPOE+	Cisco IOS XE 17.5.1
C9400X-SUP-2	C9400-LC-48U	Cisco Catalyst 9400 Series 48-Port UPOE 10/100/1000 (RJ-45)	Cisco IOS XE 17.7.1
	C9400-LC-48T	Cisco Catalyst 9400 Series 48-Port 10/100/1000 (RJ-45)	Cisco IOS XE 17.7.1
	C9400-LC-48UX	Cisco Catalyst 9400 Series 48-Port UPOE with 24p mGig 24p RJ-45	Cisco IOS XE 17.7.1
	C9400-LC-24XS	Cisco Catalyst 9400 Series 24-Port 10 Gigabit Ethernet (SFP+)	Cisco IOS XE 17.7.1
	C9400-LC-48P	Cisco Catalyst 9400 Series 48-Port POE+ 10/100/1000 (RJ-45)	Cisco IOS XE 17.7.1
	C9400-LC-24S	Cisco Catalyst 9400 Series 24-Port Gigabit Ethernet (SFP)	Cisco IOS XE 17.7.1
	C9400-LC-48S	Cisco Catalyst 9400 Series 48-Port Gigabit Ethernet (SFP)	Cisco IOS XE 17.7.1
	C9400-LC-48H	Cisco Catalyst 9400 Series 48-Port UPOE+ 10/100/1000 (RJ-45)	Cisco IOS XE 17.7.1
	C9400-LC-48HN	Cisco Catalyst 9400 Series 48-Port 5G multiGigabit w/ full 90W UPOE+	Cisco IOS XE 17.7.1
	C9400-LC-48HX	Cisco Catalyst 9400 Series 48-Port 10G multiGigabit w/ full 90W UPOE+	Cisco IOS XE 17.8.1

Supervisor Engine	Line card	Description	Minimum software
	C9400-LC-48XS	Cisco Catalyst 9400 Series 48-Port 10 Gigabit (SFP+)	Cisco IOS XE 17.8.1
	C9400-LC-24XY	Cisco Catalyst 9400 Series 20-Port 25G (SFP28), 4-Port 10G (SFP+)	Cisco IOS XE 17.12.1
	C9400-LC-12QC	Cisco Catalyst 9400 Series 12-Port 40G (QSFP+) or 4-Port 100G (QSFP28), 4-Port 40G (QSFP+)	Cisco IOS XE 17.12.1
C9400X-SUP-2XL	**C9400-LC-48U**	Cisco Catalyst 9400 Series 48-Port UPOE 10/100/1000 (RJ-45)	Cisco IOS XE 17.7.1
	C9400-LC-48T	Cisco Catalyst 9400 Series 48-Port 10/100/1000 (RJ-45)	Cisco IOS XE 17.7.1
	C9400-LC-48UX	Cisco Catalyst 9400 Series 48-Port UPOE with 24p mGig 24p RJ-45	Cisco IOS XE 17.7.1
	C9400-LC-24XS	Cisco Catalyst 9400 Series 24-Port 10 Gigabit Ethernet (SFP+)	Cisco IOS XE 17.7.1
	C9400-LC-48P	Cisco Catalyst 9400 Series 48-Port POE+ 10/100/1000 (RJ-45)	Cisco IOS XE 17.7.1
	C9400-LC-24S	Cisco Catalyst 9400 Series 24-Port Gigabit Ethernet (SFP)	Cisco IOS XE 17.7.1
	C9400-LC-48S	Cisco Catalyst 9400 Series 48-Port Gigabit Ethernet (SFP)	Cisco IOS XE 17.7.1
	C9400-LC-48H	Cisco Catalyst 9400 Series 48-Port UPOE+ 10/100/1000 (RJ-45)	Cisco IOS XE 17.7.1
	C9400-LC-48HN	Cisco Catalyst 9400 Series 48-Port 5G multiGigabit w/ full 90W UPOE+	Cisco IOS XE 17.7.1
	C9400-LC-48HX	Cisco Catalyst 9400 Series 48-Port 10G multiGigabit w/ full 90W UPOE+	Cisco IOS XE 17.8.1
	C9400-LC-48XS	Cisco Catalyst 9400 Series 48-Port 10 Gigabit (SFP+)	Cisco IOS XE 17.8.1
	C9400-LC-24XY	Cisco Catalyst 9400 Series 20-Port 25G (SFP28), 4-Port 10G (SFP+)	Cisco IOS XE 17.12.1
	C9400-LC-12QC	Cisco Catalyst 9400 Series 12-Port 40G (QSFP+) or 4-Port 100G (QSFP28), 4-Port 40G (QSFP+)	Cisco IOS XE 17.12.1

Performance and scalability

Table 5 highlights the performance and scalability enhancements of the Cisco Catalyst 9400 Supervisor Engine.

Table 5.   Cisco Catalyst 9400 Supervisor Engine Performance and Scalability Features

Features	Performance and scalability			
Supervisor Engine	C9400-SUP-1	C9400-SUP-1XL/C9400-SUP-1XL-Y	C9400X-SUP-2	C9400X-SUP-2XL
Centralized wired capacity	Up to 1.44 Tbps	Up to 1.44 Tbps	Up to 9.6 Tbps	Up to 9.6 Tbps
Per-slot switching Capacity	80 Gbps	240 Gbps – C9404R 120 Gbps – C9407R 80 Gbps – C9410R	240 Gbps – C9404R 240 Gbps – C9407R 240 Gbps – C9410R	480 Gbps – C9404R 480 Gbps – C9407R 480 Gbps – C9410R
Total number of MAC addresses	Up to 64,000[1]	Up to 64,000[1,2]	Up to 64,000[1,2]	Up to 64,000[1,2]
Total number of IPv4 routes (ARP plus learned routes)	Up to 112,000[3]	Up to 144,000[1,4]	Up to 256,000[5]	Up to 256,000[5]
FNF entries (v4/v6)	Up to 384,000/192,000	Up to 384,000/192,000	Up to 384,000/192,000[6]	Up to 384,000/192,000[6]
DRAM	16 GB	16 GB	16 GB	16 GB
Flash	10 GB	10 GB	10 GB	10 GB
VLAN IDs	4096	4096	4096	4096
PVST Instances	300[7]	300[7]	300	300
STP Virtual Ports (Port*VLANs) for PVST	13,000	13,000	13,000	13,000
STP Virtual Ports (Port* VALNs) for MST	13,000	13,000	13,000	13,000
SSD capacity	960 GB	960 GB	960 GB	960 GB
Total Switched Virtual Interfaces (SVIs)	1,000	1,000	1,000	1,000
Jumbo frame	9216 bytes	9216 bytes	9216 bytes	9216 bytes
Forwarding rate	• 900 Mpps for IPv4 • 782.6 Mpps for IPv6 (@95 byte)	• 900 Mpps for IPv4 • 782.6 Mpps for IPv6 (@95 byte)	• 3 Bpps for IPv4 and IPv6	• 3 Bpps for IPv4 and IPv6
IPv4 routing entries	Up to 112,000[3]	Up to 144,000[2,4]	Up to 256,000[2,5]	Up to 256,000[2,5]
IPv6 routing entries	Up to 56,000	Up to 56,000[2]	Up to 256,000[2,5]	Up to 256,000[2,5]

Features	Performance and scalability			
Supervisor Engine	C9400-SUP-1	C9400-SUP-1XL/C9400-SUP-1XL-Y	C9400X-SUP-2	C9400X-SUP-2XL
Multicast routes	Up to 16,000	Layer 2 up to 16,000[2] Layer 3 up to 32,000[2]	Layer 2 up to 32,000[8] Layer 3 up to 32,000[8]	Layer 2 up to 32,000[8] Layer 3 up to 32,000[8]
QoS hardware entries	Up to 18,000	Up to 18,000	Up to 16,000[2]	Up to 16,000[2]
Security ACL hardware entries	Up to 18,000	Up to 18,000	Up to 16,000[2]	Up to 16,000[2]
2 Packet buffer	96 MB	96 MB	108 MB	108 MB

[1] 24,000 host + 32,000 indirect

[2] Varies based on selected flexible ASIC template. Flexible ASIC template currently not supported on C9400X-SUP-2/2XL in software

[3] 48,000 host + 64,000 indirect

[4] 80,000 host + 64,000 indirect

[5] Currently 112,000 IPv4/IPv6 Routes are supported without template

[6] Currently 288,000/144,000 FNF entries are supported without template

[7] 300 with IOS XE 17.1.1 or later. 256 with IOSXE 16.12 or earlier

[8] Currently Layer2 and Layer3 Multicast routes scale is 16,000 without template

Host routes refer to any /32 routes, including those that are learned indirectly (for instance, learned over Open Shortest Path First [OSPF] or other routing protocols). It does not mean the supervisor module can install 80,000 directly connected clients (/32) for attached VLANs or SVIs. In other words, directly connected routes in engineering terms refers to any /32 prefix. This includes clients attached to switch's own VLAN/SVI and those /32 prefixes learned over any routing protocols as well. An indirectly connected route is a route with a prefix other than /32.

Flexible ASIC templates

Flexible ASIC templates[1] enable universal deployments by leveraging the Unified Access Data Plane's (UADP) 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 flexible ASIC template may be selected to configure the switch for specific features.

The following flexible ASIC templates are supported on Cisco Catalyst 9400 Series switches:

- Access: Maximizes system resources for MAC addressing and security.
- Core: Maximizes system resources for unicast and multicast routing.
- Software-Defined access (SD-Access): Maximizes system resources to support fabric deployment.
- Network Address Translation (NAT): Maximizes system resources for Layer 3 and NAT to support collapsed core WAN deployments.

[1] Currently not supported on C9400X-SUP-2/2XL in software.

Table 6. Cisco Catalyst 9400 Series switches and flexible ASIC templates

Supervisor Engine	C9400-SUP-1	C9400-SUP-1XL/ C9400-SUP-1XL-Y		
Template name	**Access**	**Access**	**Core**	**SDA**
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	48,000 / 24,000	32,000 / 16,000	80,000 / 40,000
Layer 2 Multicast	16,000	16,000	16,000	16,000
Layer 3 Multicast	16,000	16,000	32,000	16,000
MAC address	64,000	64,000	16,000	16,000
SGT label	8,000	8,000	8,000	8,000
Flexible NetFlow	384,000	384,000	384,000	384,000
Security ACL	18,000	18,000	18,000	18,000
QoS ACL	18,000	18,000	18,000	18,000
PBR / NAT	2,000	2,000	2,000	2,000
Tunnel	1000	1000	1000	1000
LISP	1000	1000	1000	1000
MPLS L3VPN VRF	256	256	256	N/A
MPLS label	12000	12000	16000	N/A
MPLS L3VPN routes VRF	32000	32000	32000	N/A
MPLS L3VPN routes prefix	4000	4000	4000	N/A

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 and the foundation for your digital network. Built on the principles of Cisco Networking Cloud, 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 you 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 the SD-Access Solution Overview.

Cisco StackWise Virtual

StackWise Virtual is an advanced virtual stacking technology that supports both access and distribution deployments through multiple topologies (such as two nodes or a ring). It provides higher scale for system virtualization at the network layer. Cisco Catalyst 9400 Series switches support StackWise Virtual with a two-node topology on select models. Refer to the Release Notes for more details.

StackWise Virtual in the distribution layer of the network interacts with the access and core layer switches as if it were a single logical switch. An access/core switch connects to both switches of the StackWise Virtual switch using one logical port channel called a Multichassis EtherChannel (MEC). The MEC enables the StackWise Virtual switches to provide redundancy and load-balancing on the port channel.

This capability enables a loop-free layer-2 network topology, since the StackWise Virtual switches are treated as one logical switch for both access and core switches. The StackWise Virtual switch also simplifies the layer-3 network topology by presenting itself as one logical switch, thus reducing the number of routing peers in the network.

Platform benefits

Cisco IOS XE opens a completely new paradigm in network configuration, operation and monitoring through network automation. Cisco's automation solution is open, standards-based and extensible across the entire lifecycle of a network device. Various mechanisms employed to bring about the ease of network automation are outlined below based.

- **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 like Plug and Play along with off-the-shelf tools like Zero Touch Provisioning and Pre-boot Execution Environment (PXE) that enable an effortless and automated deployment.

- **API-driven configuration:** A modern network switch like Cisco Catalyst 9400 Series switches support a wide range of automation features and provides robust open APIs over Network Configuration Protocol (NETCONF) and RESTconf using YANG data models for external tools, both off-the-shelf and custom-built, so you can 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 of a data set in a YANG model. The subscribed data set is streamed to the destination at a configured interval. Additionally, open Cisco IOS XE enables the push model, which provides near real-time monitoring of the network leading to quick detection and rectification of failure situations.

Security

- **Encrypted Traffic Analytics (ETA)[1]:** ETA is a unique capability for identifying malware in encrypted traffic from the access layer. Since more and more traffic is becoming encrypted, the visibility this feature affords for threat detection is critical for keeping your networks secure at different layers. Additionally, ETA is able detect vulnerable implementations in encrypted traffic.

- **Advanced Encryption Standard (AES)-256 MACsec encryption[2]:** AES is the IEEE 802.1AE standard for authenticating and encrypting packets between switches and endpoints. Cisco Catalyst 9400 Series switches are hardware capable 256-bit and 128-bit AES on all ports at all speeds providing the most secure link encryption.

- **Trustworthy solutions:** Cisco Trust Anchor Technologies provide a highly secure foundation for Cisco products. With Cisco Catalyst 9400 Series switches, Trust Anchor Technologies enable hardware and software authenticity assurance for supply chain trust and strong mitigation against man-in-the-middle compromise of software and firmware. Trust Anchor capabilities include:

  ◦ **Image signing:** Cryptographically signed images provide assurance that the firmware, BIOS, and other software are authentic and unmodified. As the system boots, the system's software signatures are checked for integrity.

  ◦ **Secure Boot:** Secure Boot anchors the boot sequence chain of trust to immutable hardware, mitigating threats against a system's foundational state and the software that is to be loaded, regardless of a user's privilege level. It provides layered protection against the persistence of illicitly modified firmware.

- **Cisco Trust Anchor module:** This tamper-resistant, strong-cryptographic, single-chip solution provides hardware authenticity assurance to uniquely identify the product so that its origin can be confirmed to Cisco, providing assurance that the product is genuine.

[1] ETA is currently not supported in C9400X-SUP-2/2XL.

[2] MACsec is currently not supported in hardware in C9400-SUP-1XL-Y.

Resiliency and high availability

Cisco Catalyst 9400 Series switches are designed for excellent nonstop communications with noninterrupted hardware switching. With Cisco IOS XE Software, you can continue to reap the benefit of this best-in-class resiliency in various ways.

- Cross-Stack EtherChannel provides the ability to configure Cisco EtherChannel technology across different members of the stack for high resiliency.

- IEEE 802.1s Multiple Spanning Tree Protocol (MSTP) provides rapid spanning tree convergence independent of spanning tree timers and also offers the benefit of Layer 2 load balancing and distributed processing.

- Per-VLAN Rapid Spanning Tree Plus (PVRST+) allows rapid spanning tree (IEEE 802.1w) reconvergence on a per-VLAN spanning tree basis, providing simpler configuration than MSTP. In both MSTP and PVRST+ modes, stacked units behave as a single spanning tree node.

- **Flexlink+:** Flexlink+ allows the setting up of active and backup interfaces or port channels, which can provide Layer 2 failover redundancy without the use of Spanning Tree Protocol (STP).

- Switch port autorecovery ("err-disable" recovery) automatically attempts to reactivate a link that is disabled because of a network error.

- NSF/SSO offers continuous packet forwarding during supervisor-engine switchover. Information is fully synchronized between supervisor engines to allow the standby supervisor engine to immediately take over in subsecond time if the primary engine fails.

- NSF/SSO dramatically improves the network reliability and availability in a Layer 2 or Layer 3 environment. NSF/SSO is essential for business-critical applications such as Voice over IP (VoIP). These features help ensure that VoIP calls are not dropped.

- ISSU allows you to upgrade or downgrade complete Cisco IOS Software images with minimal (less than 200 msec) to no disruption to the network when using a redundant Cisco Catalyst 9400 Series system with dual supervisor engines. Facilitating rapid, non-disruptive software upgrades for new line cards, new power supplies, new features, or bug fixes, ISSU offers continuous packet forwarding during the supervisor-engine switchover running different Cisco IOS Software releases.

- In addition to redundant power supplies and fans, the Cisco Catalyst C9404R, C9407R, and C9410R chassis models support 1+1 supervisor-engine redundancy, using the Supervisor Engine. The primary supervisor engine is active and is responsible for normal system operation. The secondary supervisor engine serves as a standby, monitoring the operation of the primary supervisor engine. The resiliency features of the Cisco Catalyst 9400 Series prevent network outages that could result in lost business and revenue.

- Apart from the features previously mentioned, the C9400-SUP-1 supervisor engine has resiliency built into its uplinks. Table 7 shows the uplink options on the C9400-SUP-1 and C9400-SUP-1XL supervisor engines. Table 8 shows the uplink options on the C9400-SUP-1XL-Y supervisor engine. Table 9 shows the uplink options on the C9400X-SUP-2/2XL supervisor engines.

Table 7. Cisco Catalyst C9400-SUP-1 and C9400-SUP-1XL supervisor engine uplink options

Supervisor configuration	Uplink ports options
Single supervisor	8x 10 Gigabit Ethernet ports are active (ports 1 to 8) (2x 40 Gigabit Ethernet ports are disabled [ports 9 to 10])
	2x 40 Gigabit Ethernet ports are active (ports 9 to 10) (8x 10 Gigabit Ethernet ports are disabled [ports 1 to 8])
	4x 10 Gigabit Ethernet and 1x 40 Gigabit Ethernet ports are active (the other 4x 10 Gigabit Ethernet and 1x 40 Gigabit Ethernet ports are disabled)
Dual supervisors	Active supervisor: 4x 10 Gigabit Ethernet ports are active (ports 1 to 4) (the other 4x 10 Gigabit Ethernet ports are disabled); Standby supervisor: 4x 10 Gigabit Ethernet ports (ports 1 to 4) (the other 4x10 Gigabit Ethernet ports are disabled)
	Active supervisor: 1x 40 Gigabit Ethernet port is active (port 9) (the other 1x 40 Gigabit Ethernet port is disabled); Standby supervisor: 1x 40 Gigabit Ethernet port (port 9) (the other 1x 40 Gigabit Ethernet port is disabled)
	Active supervisor: 1x 40 Gigabit Ethernet port is active (the other 1x 40 Gigabit Ethernet port and 8 x 10 Gigabit Ethernet ports are disabled); Standby supervisor: 4x 10 Gigabit Ethernet ports (the other 4x10 Gigabit Ethernet ports and 2 x 40 Gigabit Ethernet are disabled)

Table 8. Cisco Catalyst C9400-SUP-1XL-Y supervisor engine uplink options

Supervisor configuration	Uplink ports options
Single supervisor	8x 10 Gigabit Ethernet ports are active (ports 1 to 8) (2x 40 Gigabit Ethernet ports are disabled [ports 9 to 10])
	2x 40 Gigabit Ethernet ports are active (ports 9 to 10) (8x 10 Gigabit Ethernet ports are disabled [ports 1 to 8])
	4x 10 Gigabit Ethernet and 1x 40 Gigabit Ethernet ports are active (the other 4x 10 Gigabit Ethernet 1x 40 Gigabit Ethernet ports are disabled)
	2x 25 Gigabit Ethernet ports are active (ports 1 and 5) (6 x 10 Gigabit Ethernet ports are disabled (ports 2-4 and 6-8) and 2 x 40G [ports 9 to 10])
	4x 10 Gigabit Ethernet and 1 x 25 Gigabit Ethernet ports are active (the remaining ports are disabled)
	1x 25 Gigabit Ethernet and 1x 40 Gigabit Ethernet ports are active (the remaining ports are disabled)

Supervisor configuration	Uplink ports options
Dual supervisors	Active supervisor: 4x 10 Gigabit Ethernet ports are active (ports 1 to 4) (the other 4x 10 Gigabit Ethernet ports are disabled) Standby supervisor: 4x 10 Gigabit Ethernet ports (ports 1 to 4) (the other 4x10 Gigabit Ethernet ports are disabled)
	Active supervisor: 1x 40 Gigabit Ethernet port is active (port 9) (the other 1x 40 Gigabit Ethernet port is disabled) Standby supervisor: 1x 40 Gigabit Ethernet port (port 9) (the other 1x 40 Gigabit Ethernet port is disabled)
	Active supervisor: 1x 25 Gigabit Ethernet port is active (port 1) (the other 1x 25 Gigabit Ethernet port is disabled) Standby supervisor: 1x 25 Gigabit Ethernet port (port 1) (the other 1x 25 Gigabit Ethernet port is disabled)
	Active supervisor: 1x 25 Gigabit Ethernet port is active (the remaining ports are disabled); Standby supervisor: 1x 40 Gigabit Ethernet port (the remaining ports are disabled) vice versa
	Active supervisor: 1x 25 Gigabit Ethernet port is active (the remaining ports are disabled) Standby supervisor: 4 x 10 Gigabit Ethernet port (the remaining ports are disabled) vice versa
	Active supervisor: 1x 40 Gigabit Ethernet port is active (the other 1x 40 Gigabit Ethernet port and 8 x 10 Gigabit Ethernet ports are disabled) Standby supervisor: 4x 10 Gigabit Ethernet ports (the other 4x10 Gigabit Ethernet ports and 2 x 40 Gigabit Ethernet are disabled) vice versa

Note: LRM optics are currently not supported on the C9400-SUP-1XL-Y supervisor engine

Table 9.   Cisco Catalyst C9400X-SUP-2/2XL supervisor engine uplink options

Supervisor configuration	Uplink ports options
Single supervisor	4x 10/25 Gigabit Ethernet ports are active, 3x 40/100 Gigabit Ethernet ports are active and 1X100 Gigabit Ethernet ports is disabled
	4x 40/100 Gigabit Ethernet ports are active and 4x 10/25 Gigabit Ethernet ports are disabled
Dual supervisors	Active supervisor: 4x 10/25 Gigabit Ethernet ports are active and 1x 40/100Gigabit Ethernet port is active other 3x 40/100 Gigabit Ethernet ports are disabled Standby supervisor: 4x 10/25 Gigabit Ethernet ports are active and 1x 40/100Gigabit Ethernet port is active other 3x 40/100 Gigabit Ethernet ports are disabled
	Active supervisor: 2x 40/100 Gigabit Ethernet port is active, 4x 10/25 Gigabit Ethernet ports are disabled the other 2x 40/100 Gigabit Ethernet port is disabled Standby supervisor: 2x 40/100 Gigabit Ethernet port is active, 4x 10/25 Gigabit Ethernet ports are disabled the other 2x 40/100 Gigabit Ethernet port is disabled

Flexible NetFlow

- **Flexible NetFlow (FNF):** Cisco IOS Software FNF is the next generation in flow visibility technology, allowing optimization of the network infrastructure, reducing operational costs, and improving capacity planning and security incident detection with increased flexibility and scalability.

Open standards based fabric

The Cisco Catalyst 9400 Series Switches support modern fabric technologies such as VXLAN with BGP-EVPN control plane, with open APIs. This technology provides the flexibility to build open standards based fabrics to secure infrastructure, users and data. This fabric architecture provides rich unicast and multicast protocol support to optimally route or bridge traffic as well as support for integrated campus services all of which can be automated via open APIs to effectively configure and monitor the network.

Programmability

Cisco IOS XE provides open standards based APIs such as NETCONF, RESTCONF, gNMI to simplify provisioning and configuration, that allows network administrators to save time when provisioning new network devices and to prevent the human errors that often are a byproduct of manual configuration. Integrating Zero Touch Provisioning with various Devops toolkits allows network admins to drastically reduce the time and resources needed to onboard a device onto their network. The ability to collect real-time statistics through model driven telemetry through gRPC and gNMI allows administrator to integrate to many health monitoring tools to optimize their environments and to troubleshoot and provide alerts about any potential problems.

Application visibility and control

- **Advanced analytics:** Superior FNF reports application performance and activities within the network to any supported NetFlow collector, such as Cisco Stealthwatch® or any compliant third-party tool.

QoS

- **Superior QoS:** Cisco Catalyst 9400 Series switches offers Gigabit Ethernet speeds with intelligent services that keep traffic flowing smoothly, even at 10 times the normal network speed. Industry-leading mechanisms for cross-stack marking, classification, and scheduling deliver superior performance for data, voice, and video traffic at wire speed. This includes granular wireless bandwidth management and fair sharing, 802.1p Class of Service (CoS) and Differentiated Services Code Point (DSCP) field classification, Shaped Round Robin (SRR) scheduling, Committed Information Rate (CIR), and eight egress queues per port.

Smart operation

- **Bluetooth enabled:** Cisco Catalyst 9400 Series switches have the hardware support to connect a Bluetooth dongle to your switch to use this wireless interface as a Management port. This port functions as an IP management interface and can be used to configure and troubleshoot using the WebUI, CLI, and transfer images and configurations.

- **WebUI:** WebUI is an 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. WebUI can be used by customers to build a configuration, monitor and troubleshoot the device without having to know how to use the CLI.

- **Efficient switch operation:** Cisco Catalyst 9400 Series switches provide optimum power savings with Energy Efficient Ethernet (EEE) on the RJ-45 ports and low power operations for industry best-in-class power management and power consumption capabilities. The ports are capable of reduced power modes so that ports not in use can move into a lower power utilization state. Other efficient switch operation features are:

  ○ The per-port power consumption command allows you to specify maximum power setting on an individual port.

  ○ Per-port PoE power sensing measures the actual power being drawn, enabling more intelligent control of powered devices. The PoE MIB provides proactive visibility into power usage and lets you set different power level thresholds.

- **RFID tags:** Cisco Catalyst 9400 Series switches have an embedded RFID tag which facilitates easy asset and inventory management using commercial RFID readers.

- **Blue Beacon:** Cisco Catalyst 9400 Series switches support a blue beacon LED which allows easy identification of the switch being accessed.

High-Performance IP Routing

The Cisco Express Forwarding hardware routing architecture delivers extremely high-performance IP routing in the Cisco Catalyst 9400 Series switches, based on these features:

- IP unicast routing protocols (static, Routing Information Protocol Version 1 [RIPv1], RIPv2, RIPng, and Open Shortest Path First [OSPF] Routed Access) are supported for small network routing applications with the Network Essentials stack. Equal-cost routing facilitates Layer 3 load balancing and redundancy across the stack.

- Advanced IP unicast routing protocols (Full OSPF, Enhanced Interior Gateway Routing Protocol [EIGRP], Border Gateway Protocol Version 4 [BGPv4], and Intermediate System-to-Intermediate System Version 4 [IS-ISv4]) are supported for load balancing and constructing scalable LANs. IPv6 routing using OSPFv3 and EIGRPv6 is supported in hardware for maximum performance.

- Protocol-Independent Multicast (PIM) for IP multicast routing is supported, including PIM Sparse Mode (PIM SM), and Source-Specific Multicast (SSM).

- IPv6 addressing is supported on interfaces with appropriate show commands for monitoring and troubleshooting.

Multiprotocol Label Switching (MPLS)

The Cisco Catalyst 9400 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 UPOE+ IEEE 802.3bt Type 4: PoE removes the need for wall power to each PoE-enabled device and eliminates the cost for additional electrical cabling and circuits that would otherwise be necessary in IP phone and WLAN deployments. Cisco UPOE+ enables 90W of power per port. This facilitates delivery of network power to a broad range of devices requiring higher power. These devices include virtual desktop terminals, IP turrets, compact switches, building management gateways, PTZ cameras, LED lights, wireless access points and IP phones. The Cisco Catalyst 9400 Series also supports Cisco UPOE (60 watts), PoE+ (30 watts), and PoE (15 watts), thereby addressing the largest range of network power needs.

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.

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

Managing licenses with Smart Accounts: Creating Smart Accounts by using Cisco Smart Software Manager (SSM) enables you to order devices and licensing packages and also manage your software licenses from a centralized website. You can set up Cisco SSM to provide daily email alerts and to notify you of expiring add-on licenses that you want to renew.

You must order an add-on license in order to purchase a 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.

Note: You are not required to deploy Cisco DNA Center, just to use one of the add-on software packages

Specification

Table 10 shows information on dimensions, weight, acoustic characteristics and Mean Time Between Failures (MTBF).

Table 10. Dimensions, Weight, Acoustic, and MTBF Details

Features	Specifications	
Physical specifications	C9400-SUP-1/1XL/1XL-Y (H x W x D): 1.6 x 14.92 x 14.57 in. (4.06 x 37.90 x 37.00 cm) Weight: 10 lb (4.5 kg)	C9400X-SUP-2/2XL- (H x W x D): 1.6 x 14.92 x 14.57 in. (4.06 x 37.90 x 37.00 cm) Weight: 11.5 lb (5.2 kg)
Operating temperature	Normal operating* temperature and altitudes: • 23° to 113°F (–5° to +45°C), up to 6000 feet (1800 m) • 23° to 104°F (–5° to +40°C), up to 10,000 feet (3000 m) *Minimum ambient temperature for cold startup is 0°C Short-term** exceptional conditions: • 23° to 131°F (–5° to +55°C), up to 6000 feet (1800 m) • 23° to 122°F (–5° to +50°C), up to 10,000 feet (3000 m) **Not more than following in one-year period: 96 consecutive hours, or 360 hours total, or 15 occurrences	
Storage temperature	40° to 158°F (–40° to 70°C)	
Relative humidity operating and nonoperating noncondensing	10 to 95 percent, noncondensing	
Altitude	–60 to 3000m	
MTBF	C9400-SUP-1: 253,010 hours C9400-SUP-1XL: 253,010 hours C9400-SUP-1XL-Y: 237,670 hours C9400X-SUP-2: 304,308 hours C9400X-SUP-2XL: 304,315 hours	

Supported pluggables

For details about the different optical modules and the minimum Cisco IOS Software release required for each of the supported optical modules, visit https://www.cisco.com/c/en/us/support/interfaces-modules/transceiver-modules/products-device-support-tables-list.html.

Management and Standards Support

Table 11 shows management and standards support for the Cisco Catalyst 9400 Series.

Table 11. Management and Standards Support for the Cisco Catalyst 9400 Series

Description	Specifications	
Management	BGP4-MIB	CISCO-RESILIENT-ETHERNET-PROTOCOL-MIB
	BRIDGE-MIB	CISCO-RF-MIB
	CISCO-ACCESS-ENVMON-MIB	CISCO-RMON-CONFIG-MIB
	CISCO-AUTH-FRAMEWORK-MIB	CISCO-RMON-MIB
	CISCO-BRIDGE-EXT-MIB	CISCO-RMON2-MIB
	CISCO-BULK-FILE-MIB	CISCO-RTP-METRICS-MIB
	CISCO-CABLE-DIAG-MIB	CISCO-RTTMON-ICMP-MIB
	CISCO-CALLHOME-MIB	CISCO-RTTMON-RTP-MIB
	CISCO-CDP-MIB	CISCO-SMART-LIC-MIB
	CISCO-CEF-MIB	CISCO-SNMP-TARGET-EXT-MIB
	CISCO-CLASS-BASED-QOS-MIB	CISCO-STACKMAKER-MIB
	CISCO-CONFIG-COPY-MIB	CISCO-SYSLOG-MIB
	CISCO-CONFIG-MAN-MIB	CISCO-TAP2-MIB
	CISCO-DATA-COLLECTION-MIB	CISCO-TCP-MIB
	CISCO-DHCP-SNOOPING-MIB	CISCO-USER-CONNECTION-TAP-MIB
	CISCO-DYNAMIC-ARP-INSPECTION-MIB	CISCO-VLAN-IFTABLE-RELATIONSHIP-MIB
	CISCO-EMBEDDED-EVENT-MGR-MIB	CISCO-VLAN-MEMBERSHIP-MIB
	CISCO-ENERGYWISE-MIB	CISCO-VOIP-TAP-MIB
	CISCO-ENHANCED-IMAGE-MIB	CISCO-VTP-MIB
	CISCO-ENHANCED-MEMPOOL-MIB	DIFFSERV-MIB
	CISCO-ENTITY-ASSET-MIB	DISMAN-EXPRESSION-MIB

Description	Specifications	
	CISCO-ENTITY-DIAG-MIB	ENTITY-MIB
	CISCO-ENTITY-EXT-MIB	ENTITY-STATE-MIB
	CISCO-ENTITY-FRU-CONTROL-MIB	ENTITY-VENDORTYPE-OID-MIB
	CISCO-ENTITY-PERFORMANCE-MIB	ETHERLIKE-MIB
	CISCO-ENTITY-QFP-MIB	EVENT-MIB
	CISCO-ENTITY-SENSOR-MIB	HC-ALARM-MIB
	CISCO-ENTITY-VENDORTYPE-OID-MIB	HC-RMON-MIB
	CISCO-ENVMON-MIB	IP-FORWARD-MIB
	CISCO-ERR-DISABLE-MIB	IP-MIB
	CISCO-ETHERLIKE-EXT-MIB	IPMROUTE-STD-MIB
	CISCO-FLASH-MIB	LLDP-MED-MIB
	CISCO-FLOW-MONITOR-MIB	LLDP-MIB
	CISCO-FTP-CLIENT-MIB CISCO-HSRP-	
	EXT-MIB CISCO-HSRP-MIB CISCO-IEEE8021-PAE-MIB CISCO-IEEE8023-LAG-MIB CISCO-IETF-BFD-MIB CISCO-IETF-DHCP-SERVER-MIB CISCO-IETF-FRR-MIB CISCO-IETF-PW-MPLS-MIB CISCO-IF-EXTENSION-MIB CISCO-IF-MIB CISCO-IGMP-FILTER-MIB CISCO-IMAGE-LICENSE-MGMT-MIB CISCO-IMAGE-MIB CISCO-IP-CBR-METRICS-MIB CISCO-IP-SEC-MIB CISCO-IP-URPF-MIB CISCO-IPMROUTE-MIB CISCO-L2-CONTROL-MIB CISCO-L2L3-INTERFACE-CONFIG-MIB CISCO-LICENSE-MGMT-MIB CISCO-LLDP-EXT-MED-MIB CISCO-LOCAL-AUTH-USER-MIB CISCO-MAC-AUTH-BYPASS-MIB CISCO-MAC-NOTIFICATION-MIB CISCO-MDI-METRICS-MIB CISCO-MEDIA-METRICS-MIB CISCO-MEMORY-POOL-MIB CISCO-NBAR-PROTOCOL-DISCOVERY-MIB CISCO-PAGP-MIB CISCO-PIM-MIB	MAU-MIB MPLS-LSR-STD-MIB MPLS-TE-MIB MPLS-VPN-MIB MSDP-MIB NHRP-MIB NOTIFICATION-LOG-MIB NTPv4-MIB OLD-CISCO-CHASSIS-MIB OLD-CISCO-CPU-MIB OLD-CISCO-INTERFACES-MIB OLD-CISCO-IP-MIB OLD-CISCO-MEMORY-MIB OLD-CISCO-SYSTEM-MIB OLD-CISCO-TCP-MIB OLD-CISCO-TS-MIB OLD-MPLS-LSR-MIB POWER-ETHERNET-MIB RFC1213-MIB RFC2668-MIB RFC2982-MIB SMON-MIB SNMP-FRAMEWORK-MIB SNMP-MPD-MIB SNMP-NOTIFICATION-MIB SNMP-TARGET-MIB SNMPv2-MIB SONET-MIB TCP-MIB UDP-MIB VRRPV3-MIB VTP-MIB

Description	Specifications	
	CISCO-PORT-SECURITY-MIB CISCO-PORT-STORM-CONTROL-MIB CISCO-POWER-ETHERNET-EXT-MIB CISCO-PRIVATE-VLAN-MIB CISCO-PROCESS-MIB CISCO-PRODUCTS-MIB	
Standards	Ethernet: IEEE 802.3 10 Gigabit Ethernet: IEEE 802.3ae IEEE 802.1D Spanning Tree Protocol IEEE 802.1w Rapid Reconfiguration of Spanning Tree IEEE 802.1s Multiple VLAN Instances of Spanning Tree IEEE 802.3ad LACP IEEE 802.1p CoS Prioritization IEEE 802.1Q VLAN IEEE 802.1X User Authentication RMON I and II standards SNMPv1, SNMPv2c, and SNMPv3	

Power consumption of supervisor engine

Active supervisor C9400-SUP-1/XL/XL-Y power: Maximum power (400W).

Standby supervisor C9400-SUP-1/XL/XL-Y power: Maximum power (400W).

Active supervisor C9400X-SUP-2/2XL power: Maximum power (650W).

Standby supervisor C9400X-SUP-2/2XL power: Maximum power (650W).

This result is not indicative of the actual power draw during operation. It is the absolute maximum value recommended for facility power, system configuration and cooling capacity planning. Typical power draw is about 40%-75% maximum rated power value shown.

Safety and compliance

Table 12 lists safety and compliance information for Cisco Catalyst 9400 Series switches.

Table 12. Safety and Compliance Information for the Cisco Catalyst 9400 Series

Description	Specifications
Safety certifications	• UL 60950-1 • CAN/CSA-C222.2 No. 60950-1 • EN 60950-1 • IEC 60950-1 • AS/NZS 60950.1 • IEEE 802.3
Electromagnetic emissions certifications	• 47 CFR Part 15 • CISPR22 Class A • EN 300 386 V1.6.1 • EN 55022 Class A • EN 55032 Class A • CISPR 32 Class A • EN61000-3-2 • EN61000-3-3 • ICES-003 Class A • TCVN 7189 Class A • V-3 Class A • CISPR24 • EN 300 386 • EN55024 • TCVN 7317
Environmental	Reduction Of Hazardous Substances (ROHS) 5

Warranty

Cisco Catalyst 9400 Series switches come with a Cisco Enhanced Limited Lifetime Warranty (E-LLW) that includes Next-Business-Day (NBD) delivery of replacement hardware where available and 90 days of 8x5 Cisco Technical Assistance Center (TAC) support.

Your formal warranty statement, including the warranty applicable to Cisco software, appears in the information packet that accompanies your Cisco product. We encourage you to review the warranty statement shipped with your specific product carefully before use.

Cisco reserves the right to refund the purchase price as its exclusive warranty remedy.

For further information about warranty terms, visit https://www.cisco.com/go/warranty.

Table 13 provides information about the E-LLW.

Table 13.   E-LLW Details

	Cisco E-LLW
Devices covered	Applies to Cisco Catalyst 9400 Series Switches.
Warranty duration	As long as the original customer owns the product.
End-of-life policy	In the event of discontinuance of product manufacture, Cisco warranty support is limited to 5 years from the announcement of discontinuance.
Hardware replacement	Cisco or its service center will use commercially reasonable efforts to ship a replacement for NBD delivery, where available. Otherwise, a replacement will be shipped within 10 working days after receipt of the Return Materials Authorization (RMA) request. Actual delivery times might vary depending on customer location.
Effective date	Hardware warranty commences from the date of shipment to customer (and in case of resale by a Cisco reseller, not more than 90 days after original shipment by Cisco).
TAC support	Cisco will provide during business hours, 8 hours per day, 5 days per week, basic configuration, diagnosis, and troubleshooting of device-level problems for up to a 90-day period from the date of shipment of the originally purchased Cisco Catalyst 9400 Series product. This support does not include solution or network-level support beyond the specific device under consideration.
Cisco.com access	Warranty allows guest access only to Cisco.com.

Product sustainability

Sustainability Topic		**Reference**
General	Information on product-material-content laws and regulations	Materials
	Information on electronic waste laws and regulations, including our products, batteries and packaging	WEEE Compliance
	Sustainability Inquiries	Contact: csr_inquiries@cisco.com
	Information on product takeback and reuse program	Cisco Takeback and Reuse Program
	Regulatory and compliance	Table 9: Regulatory and compliance information
	Mean Time Between Failures – MTBF (hours)	Table 10: MTBF Information
Power	Power Specification	Table 7: Cisco Catalyst 9400 Series Power supply specifications
	Power cord options	Table 8. Cisco Catalyst 9400 Series power- cord options
	Fan	Table 1. Chassis Feature
	Energy Efficient Ethernet	Smart operation

Sustainability Topic		Reference
	Power over ethernet (Cisco UPOE and UPOE+)	[Power over ethernet leadership](#)
	Power	[Table 17. Power connectors](#)
	Power consumption (ATIS)	Table 7:Cisco Catalyst 9400 Series Power supply specifications
Material	Product packaging weight and materials	Contact: environment@cisco.com
	Dimensions	Table.6: Physical specifications of Cisco Catalyst 9400 Series chassis
	Weight	Table.6: Physical specifications of Cisco Catalyst 9400 Series chassis
	Elimination of wet paint on plastic bezel	[2019 Cisco Corporate Social Responsibility Report](#), Pg. 19 Stepping up our work on circularity

Cisco Services for Next-Generation Cisco Catalyst Switches

Achieve infrastructure excellence faster and with less risk. Cisco Catalyst 900 Services provide expert guidance to help you successfully deploy, manage and support the new Catalyst 9000 family of switches. With unmatched networking expertise, best practices and innovative tools, we can help you reduce overall upgrade, refresh, and migration costs as you introduce new hardware, software and protocols into the network. Offering a comprehensive lifecycle of services – from implementation, optimization, technical and managed services – Cisco experts help you minimize disruption and achieve operational excellence to extract maximum value from your Cisco Network Cloud ready infrastructure. Learn more about [Cisco Services for Enterprise Networks](#).

Ordering

Table 14 contains supervisor ordering information for the Cisco Catalyst 9400 Series.

Table 14.   Cisco Catalyst 9400 Series supervisor Ordering information

Product number	Description
C9400-SUP-1(=)	Cisco Catalyst 9400 Series Supervisor v1 Module
C9400-SUP-1/2	Cisco Catalyst 9400 Series Redundant Supervisor v1 Module
C9400-SUP-1XL(=)	Cisco Catalyst 9400 Series Supervisor v1XL Module
C9400-SUP-1XL/2	Cisco Catalyst 9400 Series Redundant Supervisor v1XL Module
C9400-SUP-1XL-Y(=)	Cisco Catalyst 9400 Series Supervisor v1XL with 25G Module
C9400-SUP-1XL-Y/2	Cisco Catalyst 9400 Series Redundant Supervisor v1XL with 25G Module
C9400X-SUP-2(=)	Cisco Catalyst 9400 Series Supervisor 2 Module
C9400X-SUP-2/2	Cisco Catalyst 9400 Series Redundant Supervisor 2 Module

Product number	Description
C9400X-SUP-2XL(=)	Cisco Catalyst 9400 Series Supervisor 2XL Module
C9400X-SUP-2XL/2	Cisco Catalyst 9400 Series Redundant Supervisor 2XL Module
C9400-SSD-240GB	Cisco Catalyst 9400 Series 240GB M2 SATA memory (Supervisor)
C9400-SSD-480GB	Cisco Catalyst 9400 Series 480GB M2 SATA memory (Supervisor)
C9400-SSD-960GB	Cisco Catalyst 9400 Series 960GB M2 SATA memory (Supervisor)
C9400-DNA-E	Catalyst 9400 Cisco DNA Essentials Term license
C9400-DNA-E-3Y	Catalyst 9400 Cisco DNA Essentials 3 Year Term license
C9400-DNA-E-5Y	Catalyst 9400 Cisco DNA Essentials 5 Year Term license
C9400-DNA-E-7Y	Catalyst 9400 Cisco DNA Essentials 7 Year Term license
C9400-DNA-A	Catalyst 9400 Cisco DNA Advantage Term license
C9400-DNA-A-3Y	Catalyst 9400 Cisco DNA Advantage 3 Year Term license
C9400-DNA-A-5Y	Catalyst 9400 Cisco DNA Advantage 5 Year Term license
C9400-DNA-A-7Y	Catalyst 9400 Cisco DNA Advantage 7 Year Term license
C9400-NW-E	Cisco Catalyst 9400 Network Essential License
C9400-NW-A	Cisco Catalyst 9400 Network Advantage License
C9400-LIC=	Electronic SW License for Cisco Catalyst 9400 Switches
C9400-DNA-E-A	C9400 NW and Cisco DNA Essentials to NW and Cisco DNA Advantage Upgrade
C9400-DNA-E-A-3	C9400 NW and Cisco DNA Essentials to NW and Cisco DNA Adv Upgrade License (3Y)
C9400-DNA-E-A-5	C9400 NW and Cisco DNA Essentials to NW and Cisco DNA Adv Upgrade License (5Y)
C9400-DNA-E-A-7	C9400 NW and Cisco DNA Essentials to NW and Cisco DNA Adv Upgrade License (7Y)

*Note: Cisco DNA Essentials subscriptions Essentials is sold only in bundles in for Catalyst 9400 Series switches

Cisco Catalyst software SKUs

SKU	Product Description
C9400-DNX-A-3Y	C9400 Adv software subscription, Chassis, 3 Yr Lic
C9400-DNX-A-5Y	C9400 Adv software subscription, Chassis, 5 Yr Lic
C9400-DNX-A-7Y	C9400 Adv software subscription, Chassis, 7 Yr Lic
C9400-DNX-E-3Y	C9400 Ess software subscription, Chassis, 3 Yr Lic
C9400-DNX-E-5Y	C9400 Ess software subscription, Chassis, 5 Yr Lic
C9400-DNX-E-7Y	C9400 Ess software subscription, Chassis, 7 Yr Lic

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Document history

New or Revised Topic	Described In	Date
Addition of new fiber line cards		
Added SUP-2/2XL supervisors and line cards. Removed Premier license.	Where appropriate	February 03, 2022
Added support for Cisco Spaces	Page 4	May 04, 2021
Added SD-Access Embedded Wireless information	Features	August 20, 2019
Added New UPOE+ Linecard information	Linecard support	August 20, 2019
Revised Table of Contents Headings	Specifications (was "Dimensions, eight, acoustic, mean time between failures"), added Document History	January 18, 2019
Text change from "add-on" to "subscription"	Page 23, Packaging section	December, 17, 2018
Product name change from "DNA" to "Cisco DNA"	Page 23, Packaging section	December, 17, 2018
Text change from "License" to "Subscription license"	Page 23, Packaging section	December, 17, 2018
Text edit to "Cisco DNA Essentials" and "Cisco DNA Advantage"	Page 23, Licensing combinations and Table 8	December, 17, 2018
Product name change to Cisco DNA Premier, Cisco DNA Advantage and Cisco DNA Essentials	Page 20, Table 10 description and caption	December, 17, 2018
Product name change to "Cisco DNA"	Page 32, Cisco Services for next-generation Cisco Catalyst switches	December, 17, 2018
Product name change to "Cisco DNA"	Page 32, Table 17	December, 17, 2018
Product number change to C9400-DNA-P	Page 32, Table 17	December, 17, 2018
Product number change to C9400-DNA-P-AA	Page 32, Table 17	December, 17, 2018
Fix typo: "Cisco DNA Essentials"	Page 32, Table 17	December, 17, 2018

New or Revised Topic	Described In	Date
Fix typo: "Cisco DNA Essentials"	Page 32, Table 17	December, 17, 2018
Text change to for Catalyst 9400 Series switches	Page 31, Table 17 footnote	December, 17, 2018
Text change to Cisco DNA Essentials subscriptions	Page 31, Table 17 footnote	December, 17, 2018
Corrected SVI's, added PVT Instance, STP Virtual ports for PVST and MST	Page 13, Table 5	October 10, 2020