

Cisco Application Centric Infrastructure

Product Overview

Cisco® Application Centric Infrastructure (Cisco ACI™) is an innovative architecture that radically simplifies, optimizes, and accelerates the entire application deployment lifecycle.

Cisco ACI uses a holistic systems-based approach, with tight integration between physical and virtual elements, an open ecosystem model, and innovation-spanning application-specific integrated circuits (ASICs), hardware, and software. This unique approach uses a common policy-based operating model across a network that supports Cisco ACI along with security elements (and computing and storage in the future), eliminating IT silos and drastically reducing cost and complexity.

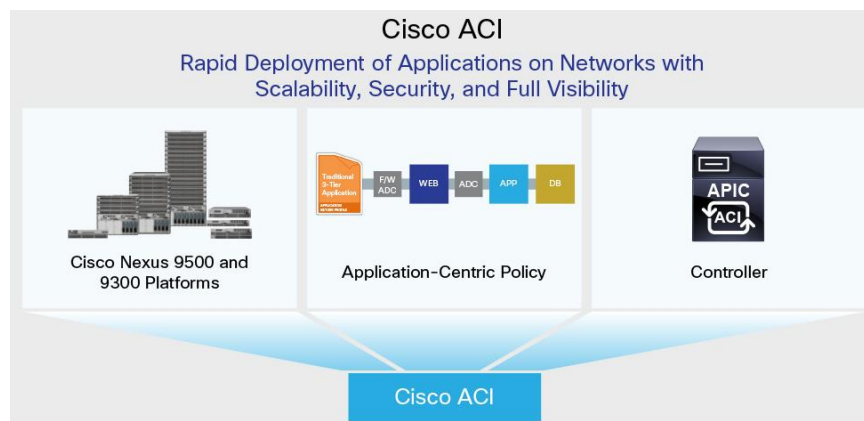
The main benefits of Cisco ACI include:

- Simplified automation with an application-based policy model
- Common platform for managing physical, virtual, and cloud-based environments
- Centralized visibility with real-time application health monitoring
- Operation simplicity, with common policy, management, and operation models across application, network, and security resources (and computing and storage resources in the future)
- Open software flexibility for development and operations (DevOps) teams and ecosystem partner integration
- Scalable performance and secure multitenancy

Cisco ACI consists of (Figure 1):

- Cisco Application Policy Infrastructure Controller (APIC)
- Cisco Nexus® 9000 Series Switches (Cisco ACI spine and leaf switches)
- Cisco ACI ecosystem

Figure 1. Cisco ACI Architecture



Cisco Application Policy Infrastructure Controller

The infrastructure controller is the main architectural component of the Cisco ACI solution. It is the unified point of automation and management for the Cisco ACI fabric, policy enforcement, and health monitoring. The APIC appliance is a centralized, clustered controller that optimizes performance and unifies operation of physical and virtual environments. The controller manages and operates a scalable multitenant Cisco ACI fabric.

The main features of the controller include:

- Application-centric network policies
- Data-model-based declarative provisioning
- Application and topology monitoring and troubleshooting
- Third-party integration (Layer 4 through Layer 7 [L4-L7] services and VMware vCenter and vShield)
- Image management (spine and leaf)
- Cisco ACI inventory and configuration
- Implementation on a distributed framework across a cluster of appliances
- Health scores for critical managed objects (tenants, application profiles, switches, etc.)
- Fault, event, and performance management
- Cisco Application Virtual Switch (AVS), which can be used as a virtual leaf switch

The controller framework enables broad ecosystem and industry interoperability with Cisco ACI. It enables interoperability between a Cisco ACI environment and management, orchestration, virtualization, and L4-L7 services from a broad range of vendors.

Cisco ACI Features

The Cisco ACI mode fabric software is an optimized version of the Cisco NX-OS Software operating system that provides a foundation for building a programmable network infrastructure. NX-OS has been rewritten as a fully object-based switch operating system for Cisco ACI. The object model enables fluid programmability and full access to the underlying components of the infrastructure using representational state transfer (REST) APIs. This approach provides a framework for network control and programmability with a degree of openness that is not found in other systems.

The infrastructure controller provides centralized access to Cisco ACI through an object-oriented REST API framework with XML and JavaScript Object Notation (JSON) binding. It also supports a modernized, user-extensible command-line interface (CLI) and GUI. APIs have full read and write access to Cisco ACI, providing tenant- and application-aware programmability, automation, and system access.

Table 1 summarizes the controller's main features. For more information about the availability of these features by release, please refer to:

- Release notes for Cisco ACI and APIC: <http://www.cisco.com/c/en/us/support/cloud-systems-management/application-policy-infrastructure-controller-apic/tsd-products-support-general-information.html>
- Release notes for Cisco Nexus 9000 Series Switches: <http://www.cisco.com/c/en/us/support/switches/nexus-9000-series-switches/products-release-notes-list.html>

Table 1. Cisco ACI Features Supported on Cisco APIC and Cisco Nexus 9000 Series Switches

Feature	Description
Integrated overlay over nonblocking 40/100 Gigabit Ethernet IP fabric	<ul style="list-style-type: none"> • IPv4 unicast and IPv4 multicast at line rate • Penalty-free application and tenant mobility • Full host mobility • Dynamic load balancing and packet prioritization • Advanced congestion management
Cisco ACI Multi-POD	<ul style="list-style-type: none"> • Multi-POD solution allows 1 APIC cluster to manage multiple ACI fabrics where each fabric is a POD. The multi-pod can be between different floors or buildings within a campus or a local metro region. Each POD is a localized fault
ACI Fabric Extension, WAN Connectivity, BGP-EVPN and External connectivity	<ul style="list-style-type: none"> • Cisco ACI fabric as a transit domain: Enables border routers to perform bidirectional route distribution with other routing domains, including route peering with service appliances • WAN Connectivity Automation: ACI Fabric and ASR9k/N7k DCI connectivity is auto-discovered and auto-provisioned based on BGP-EVPN control plane and VXLAN overlay dataplane for IPv4/IPv6 • Static routes • Routing protocols <ul style="list-style-type: none"> ◦ IPv6 data plane, with support for tenant addressing, contracts, shared services, and routing ◦ Open Shortest Path First (OSPF), Not So Stubby Area (NSSA), and OSPF v3 ◦ Enhanced Interior Gateway Routing Protocol (EIGRP) v4 ◦ External Border Gateway Protocol (eBGP) v4 and v6 and internal Border Gateway Protocol (iBGP) ◦ Shared tenant Common Layer 3 outside (L3Out) interface, with route leaking from tenant Virtual Routing and Forwarding (VRF) instance ◦ Direct server return (DSR) ◦ Common pervasive gateway for IPv4 and secondary IP address for IPv4 ◦ Allow the ability to preserve route-target extended community across ACI fabric ◦ Allow ability to disable IGMP snooping in ACI ◦ Allow native L3 PIM multicast routing inside the fabric. PIM ASM and PIM SSM are supported ◦ Allow BGP maxas-limit support to configure BGP to discard routes that have a number of as-path segments that exceed the specified value • Virtual port channel (vPC): straight-through mode to end hosts and servers • ACI 93xx-EX leaf switch support FCoE N-Port Virtualization VNP and VP ports. Priority flow control is also support for FCoE NPV ports • QSA support on ACI leaf N9K-C9332PQ to utilize 40G port as a 10G port
Systemwide application visibility and troubleshooting	<ul style="list-style-type: none"> • Cisco Switched Port Analyzer (SPAN) and Encapsulated Remote SPAN (ERSPAN) support • Atomic counters • Application and tenant health scores
Application network profiles	<ul style="list-style-type: none"> • Logical representation of all components of the application and its interdependencies on the application fabric
Policy	<ul style="list-style-type: none"> • Fabricwide policy enforcement regardless of endpoint location • Policy enforcement between endpoint groups (EPGs)
Quality of service (QoS)	<ul style="list-style-type: none"> • EPG policy classification: Class of service (CoS), Differentiated Services Code Point (DSCP), source or destination EPG, and Layer 4 port • 3 user-configurable classes of service (3 queues) • DSCP marking for IPv4, priority queue, Deficit Weighted Round Robin (DWRR), Data Redundancy Elimination (DRE) bits, and flowlet prioritization
Cisco ACI availability	<ul style="list-style-type: none"> • 3 APIC node clusters with N+2 redundancy • APIC cluster software rolling upgrade and downgrade • Standby APIC • Less than 1 second for fabric convergence after node or link failure detection (with spine redundancy and vPC) • N-way spine redundancy • APIC split-brain detection • Hot-swappable field-replaceable units (FRUs) (except Gigabit Ethernet module [GEM]) for top-of-rack (ToR) per-port VLAN: Configuration of the same VLAN ID across different EPGs (in different bridge domains) on different ports on the same leaf switch • Stretched fabric with 10-ms round-trip time (RTT) with Multiprotocol Label Switching (MPLS) pseudowire, dark fiber, and dense wavelength-division multiplexing (DWDM)

Feature	Description
Security	<ul style="list-style-type: none"> ● Permit, deny, and taboo list (blacklist), and application-centric whitelist policy model for securing both physical and virtual applications ● EPG policy filtering (source EPG, destination EPG, and Layer 4 ports) ● Microsegmentation (virtual machine attribute–based segmentation) and distributed firewall with the Cisco Application Virtual Switch (AVS) ● Microsegmentation (virtual machine attribute–based segmentation) with Microsoft Hyper-V and SCVMM ● Secure multitenancy at scale built into Cisco ACI fabric ● Built-in distributed Layer 4 security integrated into Cisco ACI fabric to secure east-west traffic ● Centralized L4-L7 security policy lifecycle management with support for broad ecosystem of security devices (physical and virtual firewalls) ● Security policies automated to move as workloads are moved in the data center ● Automated insertion of L4-L7 security services (firewall and intrusion prevention system [IPS]) in the application traffic flow for layered security defense on a per-application basis ● Accelerated threat detection and incident response ● Role-based access control (RBAC), authenticated access based on certificate authentication, Cisco Secure Access Control System (ACS), and local authentication ● AAA RBAC integration ● Cluster manager for L4-L7 services (Cisco Sourcefire® services and services from Citrix, F5 Networks, etc.) ● Network-only services stitching without L4-L7 configuration automation ● Auditing of all user access and changes ● The ability to configure mac-limits on ACI leaf ports ● Permit Logging: A log entry is created when any packet is permitted by ACI contract filter entry. Cisco AVS distributed firewall permit logging is also supported
Centralized fabric management	<ul style="list-style-type: none"> ● Automatic fabric discovery ● Single pane across network, hypervisors, and L4-L7 services ● Intuitive GUI, extensible CLI, and REST APIs ● NX-OS style of CLI on the APIC and access to all switches through the controller
Management upgrades, versioning, and scaling	<ul style="list-style-type: none"> ● Switch and APIC upgrades across the fabric ● Support for multiple software versions for leaf and spine switches per APIC domain ● Touchless ToR addition to fabric (zero-touch plug and play)
Troubleshooting GUI	<ul style="list-style-type: none"> ● Wizard for troubleshooting ● Capacity dashboard ● Heat map
Secure user authentication	<ul style="list-style-type: none"> ● TACACS+, RADIUS, and Lightweight Directory Access Protocol (LDAP) ● Local authentication with password and RBAC
Monitoring	<ul style="list-style-type: none"> ● Virtual network interface cards (vNICs; VMware only) <ul style="list-style-type: none"> ◦ Received and transmitted ingress and egress packets ◦ Broadcast, multicast, and dropped packets ● NX-OS and APIC processes and system <ul style="list-style-type: none"> ◦ Per leaf, spine, and APIC ◦ CPU utilization per process and overall ◦ Memory utilization per process and overall ● Protocol statistics (available on iShell) <ul style="list-style-type: none"> ◦ Intermediate System–to–Intermediate System (IS-IS) Protocol and iBGP global statistics ◦ Per logical interface and per adjacency for protocol statistics ● Service insertion <ul style="list-style-type: none"> ◦ Packets and bytes ◦ VLAN and bridge domain statistics ● ACI contract supports a new action called copy service which allows copying traffic flows between 2 EPGs or through L4-L7 devices which can be send to 1 or N destinations simultaneously. ● Health scores <ul style="list-style-type: none"> ◦ 0 to 100 with ±1 granularity ◦ Historical records of health scores ◦ AVS health status, events and fault are reported to APIC controller

Feature	Description
	<ul style="list-style-type: none"> • Fabric <ul style="list-style-type: none"> ◦ Spine, leaf, fabric extender (host interfaces [HIFs] and network interfaces [NIFs]), and vPC ◦ Ingress and egress counters ◦ Unicast, multicast, flood, and drop ◦ Digital Optical Monitoring support on ACI ports is very useful for operations when using ACI across sites with DWDM ports ◦ Full Netflow support on ToRs • EPG (VLAN and Virtual Extensible LAN [VXLAN]): aggregated <ul style="list-style-type: none"> ◦ Ingress only, unicast, and multicast ◦ Flood, VXLAN-only drop (bytes), and egress only for VLAN encapsulated traffic ◦ Per ingress EPG ◦ Per flow only (drill-down only) ◦ Endpoints (vNIC only and VMware only), drill-down, and on demand
Layer 4 through 7 services integration	<ul style="list-style-type: none"> • L4-L7 service policy automation (scripting interface) and data path integration • Service chaining; forwarding based (no policy redirection) • Policy based redirect allows redirection of traffic based on a classifier match into a service graph • Symmetric policy based routing • Service policy automation through REST API with JSON and XML • Automated service node insertion and provisioning • Health score for service and clustering degradation (through scripting interface) • Support for transparent and routed firewall modes (traditional mode) <p>For more information, view the latest Cisco ACI L4-L7 compatibility list solution overview.</p>
Virtualization integration	<ul style="list-style-type: none"> • VMware ESXi, vSphere, and vShield • VMware vSphere Distributed Switch (VDS) support with automated port-group creation for VLAN and VXLAN mapped to EPG • VMware vMotion for multiple vCenters • vMotion movement between the fabric-connected hosts • VMware vRealize integration with the APIC • Increased vCenter scale per ACI fabric to 50 • vRealize 7.0 Orchestration support along with support for ACI micro-segmentation and policy based redirect for service graphs • vRealize support for AVS workflows such as VMM domain creation and distributed firewall policy • Microsoft Azure Pack for Cloud management and Microsoft System Center Virtual Machine Manager (SCVMM) integration for hypervisor integration • vCenter Plug-in: A user interface that integrates inside the vSphere web client allowing it to manage and trouble-shoot the ACI fabric. Allows the vSphere web client to become a single pane of glass to configure both vCenter and the ACI fabric • VMM port-group name configurable delimiter for Microsoft and VMware VMM domains • Fabricwide maximum transmission unit (MTU) size • Virtual machine-level monitoring • Application Virtual Switch for Cisco ACI fabric (VMware) <p>For more information, view the latest Cisco ACI virtualization compatibility list solution overview.</p>
Cisco ACI App center	<ul style="list-style-type: none"> • Enables customers to write custom apps and extract value out of network • Extends programmability of the fabric

Cisco APIC Cluster

The APIC appliance is deployed as a cluster. A minimum of three infrastructure controllers are configured in a cluster to provide control of the scale-out Cisco ACI (Figure 2) fabric. The ultimate size of the controller cluster is directly proportionate to the size of the Cisco ACI deployment and is based on the transaction-rate requirements. Any controller in the cluster can service any user for any operation, and a controller can be transparently added to or removed from the cluster.

Figure 2. Cisco APIC Cluster

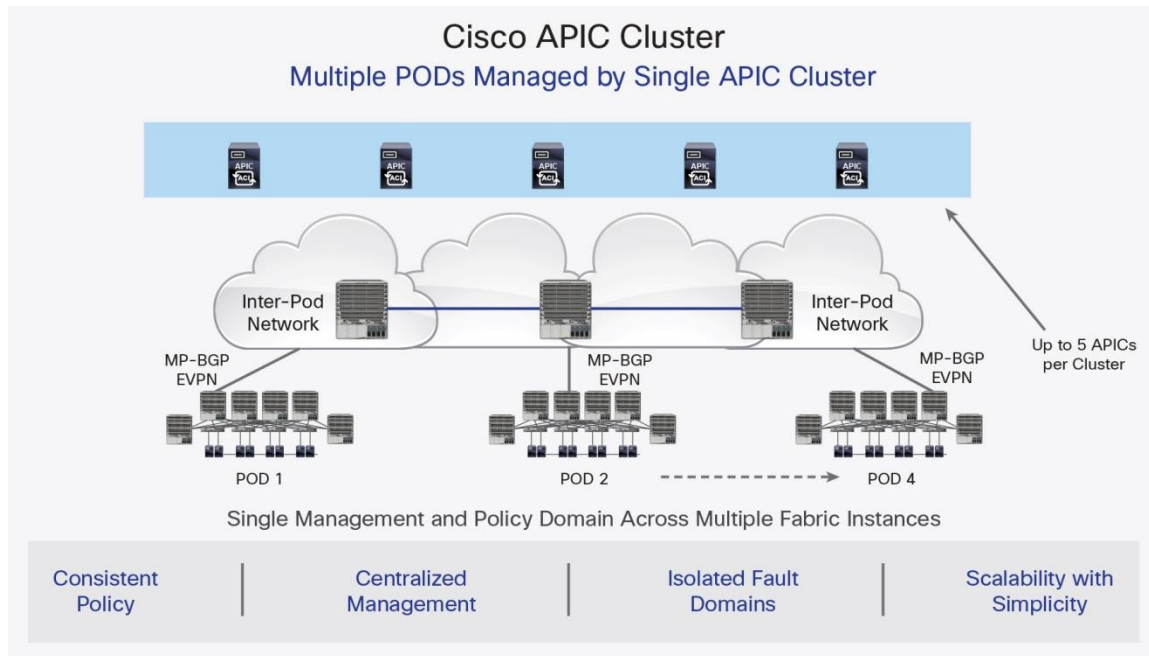
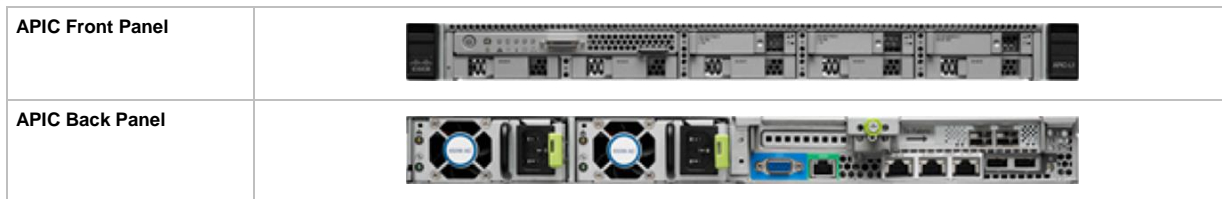


Figure 3 shows front and back panels views of the APIC appliance.

Figure 3. Cisco APIC Appliance Front and Back Views



Cisco APIC Appliance Product Specifications

The APIC appliance is available in two form factors (Table 2):

- Medium configuration
- Large configuration

Table 2. Cisco APIC Sizes

Cisco APIC Configuration	Part Number	Description
Medium	APIC-M2	APIC with medium-size CPU, hard drive, and memory configurations (up to 1000 edge ports)
Large	APIC-L2	APIC with large CPU, hard drive, and memory configurations (more than 1000 edge ports)
Medium cluster	APIC-CLUSTER-M2	Cluster of 3 APIC devices with medium-size CPU, hard drive, and memory configurations (up to 1000 edge ports)
Large cluster	APIC-CLUSTER-L2	Cluster of 3 Cisco APIC devices with large CPU, hard drive, and memory configurations (more than 1000 edge ports)
Medium (spare)	APIC-M2=	APIC with medium-size CPU, hard drive, and memory configurations (up to 1000 edge ports)
Large (spare)	APIC-L2=	APIC with large CPU, hard drive, and memory configurations (more than 1000 edge ports)

Table 3 lists the specifications of the APIC appliance. Note that at least three appliances need to be configured as a cluster.

Table 3. Cisco APIC Appliance Specifications

	Cisco APIC Appliance Medium Configuration: M2		Cisco APIC Appliance Large Configuration: L2	
	Description	Default Units	Description	Default Units
Processor	1.90-GHz Intel® Xeon® processor E5-2609 v3 with 85 watts (W), 6 cores, 15-MB cache, DDR4, and 1600 MHz	2	2.40-GHz Intel Xeon processor E5-2620 v3 with 85W, 6 cores, 15-MB cache, DDR4, and 1866 MHz	2
Memory	16-GB DDR4 2133-MHz RDIMM PC4-17000, dual-rank x4 with 1.2V	4	16-GB DDR4 2133-MHz RDIMM PC4-17000 dual-rank x4 with 1.2V	8
PCI Express (PCIe) slots	Cisco UCS® Virtual Interface Card (VIC) 1225 dual-port 10-Gbps Enhanced Small Form-Factor Pluggable (SFP+) converged network adapter (CNA) Or Cisco UCS VIC 1225T dual-port 10GBASE-T CNA	1	Cisco UCS VIC 1225 dual-port 10-Gbps SFP+ CNA Or Cisco UCS VIC 1225T dual-port 10GBASE-T CNA	1
Power supply	650W power supply	1	650W power supply	1
	Cisco APIC Appliance Medium Configuration: M1		Cisco APIC Appliance Large Configuration: L1	
Processor	2.10-GHz Intel Xeon processor E5-2620 v2, 80W, 6 cores, 15-MB cache, DDR3, and 1600 MHz	2	2.60-GHz Intel Xeon processor E5-2630 v2, 80W, 6 cores, 15-MB cache, DDR3, and 1600 MHz	2
Memory	16-GB DDR3 1866-MHz RDIMM PC3-14900, dual-rank x4 with 1.5V	4	16-GB DDR3 1866-MHz RDIMM PC3-14900, dual-rank x4 with 1.5V	8
PCIe slots	Cisco UCS VIC 1225 dual-port 10-Gbps SFP+ CNA Or Cisco UCS VIC 1225T dual-port 10GBASE-T CNA	1	Cisco UCS VIC 1225 dual-port 10-Gbps SFP+ CNA Or Cisco UCS VIC 1225T dual-port 10GBASE-T CNA	1
Power supply	650W power supply	1	650W power supply	1
Cisco APIC Medium and Large Configurations				
Physical dimensions (H x W x D)		1 rack unit (1RU): 1.7 x 16.9 x 28.5 in. (4.32 x 43 x 72.4 cm)		
Temperature: Operating		32 to 104°F (0 to 40°C) (operating, at sea level, with no fan fail and no CPU throttling, and with turbo mode)		
Temperature: Nonoperating		-40 to 158°F (-40 to 70°C)		
Humidity: Operating		10 to 90% noncondensing		
Humidity: Nonoperating		5 to 93% noncondensing		
Altitude: Operating		0 to 10,000 ft (0 to 3000m); maximum ambient temperature decreases by 1°C per 300m		
Altitude: Nonoperating		0 to 40,000 ft (12,000m)		

The first-generation APIC models listed in Table 4 will soon be phased out.

Table 4. Cisco APIC Sizes

Cisco APIC Configuration	Part Number	Description
Medium cluster	APIC-CLUSTER-M1	Cluster of 3 APIC controllers with medium-size CPU, hard drive, and memory configurations (up to 1000 edge ports)
Large cluster	APIC-CLUSTER-L1	Cluster of 3 APIC controllers with large CPU, hard drive, and memory configurations (more than 1000 edge ports)
Medium	APIC-M1	APIC with medium-size CPU, hard drive, and memory configurations (up to 1000 edge ports)

Cisco APIC Configuration	Part Number	Description
Large	APIC-L1	APIC with large CPU, hard drive, and memory configurations (more than 1000 edge ports)
Medium (spare)	APIC-M1=	APIC with medium-size CPU, hard drive, and memory configurations (up to 1000 edge ports)
Large (spare)	APIC-L1=	APIC with large CPU, hard drive, and memory configurations (more than 1000 edge ports)

Cisco Nexus 9000 Series Spine and Leaf Switches for Cisco ACI

Cisco Nexus 9000 Series Switches support Cisco ACI, and organizations can use them as spine or leaf switches to take full advantage of an automated, policy-based, systems management approach.

The Cisco Nexus 9000 Series offers modular and fixed 1, 10, and 40 Gigabit Ethernet switch configurations that are designed to operate either in NX-OS mode for compatibility and consistency with the current Cisco Nexus switches or in ACI mode to take full advantage of Cisco ACI application-policy-based services and infrastructure automation features. This dual-function capability provides customers with investment protection and ease of migration to Cisco ACI through a software upgrade.

Cisco Nexus 9000 Series Hardware Support for Cisco ACI

Table 5 lists the Cisco Nexus 9000 Series Switches that support Cisco ACI in conjunction with the APIC. Additional hardware and configurations will be supported in the future.

Table 5. Cisco Nexus 9000 Series Support for Cisco ACI

Cisco Nexus 9000 Series Switches	Part Number	Description
ToR leaf switch	N9K-C93180LC-EX	Nexus 93180LC-EX switch, 24p 40/50G QSFP+ & 6p 100G QSFP28
ToR leaf switch	N9K-C93180YC-EX	Nexus 93180YC-EX switch, 48p 1/10/25G SFP+ & 6p 100G QSFP28
ToR leaf switch	N9K-C93108TC-EX	Nexus 93108TC-EX switch, 48p 1/10BASE-T & 6p 100G QSFP28
ToR leaf switch	N9K-C9396PX	Cisco Nexus 9300 platform: 48-port 1/10 Gigabit Ethernet SFP+ and up to 12-port 40 Gigabit Ethernet Quad SFP (QSFP) switch
ToR leaf switch	N9K-C9396TX	Cisco Nexus 9300 platform: 48-port 1/10BASE-T and up to 12-port 40 Gigabit Ethernet QSFP
ToR leaf switch	N9K-C93128TX	Cisco Nexus 9300 platform: 96-port 1/10BASE-T and up to 8-port 40 Gigabit Ethernet QSFP
ToR leaf switch	N9K-C93120TX	Cisco Nexus 9300 platform: 96-port 1/10BASE-T and up to 6-port 40 Gigabit Ethernet QSFP
ToR leaf switch	N9K-C9372PX	Cisco Nexus 9300 platform: 48-port 1/10 Gigabit Ethernet SFP+ and 6-port 40 Gigabit Ethernet QSFP
ToR leaf switch	N9K-C9372PX-E	Cisco Nexus 9300 with 48-port 1/10 Gigabit Ethernet SFP+ and 6-port 40 Gigabit Ethernet QSFP+
ToR leaf switch	N9K-C9372TX	Cisco Nexus 9300 platform: 48-port 1/10BASE-T and up to 6-port 40 Gigabit Ethernet QSFP
ToR leaf switch	N9K-C9332PQ	Cisco Nexus 9300 platform: 32-port 40 Gigabit Ethernet QSFP
Spine switch	N9K-C9516-B2	Cisco Nexus 9516 Switch (16 active slots)
Spine switch	N9K-C9508-B2	Cisco Nexus 9508 Switch
Spine switch	N9K-C9504-B2	Cisco Nexus 9504 Switch
Spine switch	N9K-C9336PQ	Cisco Nexus 9336PQ ACI Spine Switch: 36 fixed-port 40 Gigabit Ethernet QSFP+
Cisco ACI line cards	N9K-X9736PQ	Cisco Nexus 9500 spine line card for Cisco ACI: 36-port 40 Gigabit Ethernet QSFP aggregation module

Cisco Nexus 2000 Series Fabric Extenders Support

Table 6 lists the Cisco Nexus 2000 Series Fabric Extenders supported in the Cisco ACI fabric.

Table 6. Cisco Nexus 2000 Series Fabric Extenders Supported in Cisco ACI

Part Number	Description
N2K-C2248PQ-10GE	Cisco Nexus 2248PQ 10GE Fabric Extender
N2K-C2248TP-E	Cisco Nexus 2248TP-E Fabric Extender
N2K-C2248TP-1GE	Cisco Nexus 2248TP GE Fabric Extender
N2K-C2232PP-10GE	Cisco Nexus 2232PP 10GE Fabric Extender
N2K-C2232TM-E	Cisco Nexus 2232TM 10GE Fabric Extender
N2K-C2348UPQ (40G FEX)	Cisco Nexus 2348UPQ 10GE Fabric Extender

Cisco Application Virtual Switch

The Application Virtual Switch for vSphere extends the Cisco ACI policy framework to virtual servers. The Application Virtual Switch is supported on servers directly attached or Layer 2 connected to the Cisco Nexus 9000 Series leaf nodes on the Cisco ACI fabric.

Cisco ACI Ordering Information

Table 7 presents ordering information for Cisco ACI components.

Table 7. Ordering Information

Part Number	Product Description
Cisco Application Policy Infrastructure Controller	
APIC-CLUSTER-M2	APIC Cluster - Medium Configurations (Up to 1000 Edge Ports)
APIC-CLUSTER-L2	APIC Cluster - Large Configurations (> 1000 Edge Ports)
APIC-M2	APIC Appliance - Medium Configuration(Up to 1000 Edge Ports)
APIC-L2	APIC Appliance - Large Configurations (> 1000 Edge Ports)
APIC-M2=	APIC Appliance - Medium Configuration(Up to 1000 Edge Ports) (SPARE)
APIC-L2=	APIC Appliance - Large Configurations (> 1000 Edge Ports) (SPARE)
Cisco Nexus 9000 Series Spine Switches (Modular)	
N9K-C9508-B3-E	Nexus 9508 Bundle for 40/100G Configurations: includes 1 Supervisor, 3 Power Supplies, 2 System Controllers, 4 FM-E Fabric Modules, 3 Fan Trays
N9K-C9504-B3-E	Nexus 9504 Bundle for 40/100G Configurations: includes 1 Supervisor, 3 Power Supplies, 2 System Controllers, 4 FM-E Fabric Modules, 3 Fan Trays
N9K-C9508-B2	Nexus 9508 Bundle 2 for 40G Configurations: includes chassis, 1 Supervisor, 2 System Controllers, 3 Fan Trays, 3 Power Supplies, 6 Fabric Modules
N9K-C9504-B2	Nexus 9504 Bundle 2 for 40G Configurations: includes chassis, 1 Supervisor, 2 System Controllers, 3 Fan Trays, 3 Power Supplies, 6 Fabric Modules
N9K-C9516-B2	Nexus 9516 Bundle 2 for 40G Configurations: includes chassis, 1 Supervisor, 2 System Controllers, 3 Fan Trays, 3 Power Supplies, 6 Fabric Modules
Cisco Nexus 9000 Series ACI Line Cards for Spine Switches (Modular)	
N9K-X9732C-EX	ACI Ready Spine Line Card: 32p QSFP28 40/100G (32p line rate)
N9K-X9736PQ	ACI Ready Spine Line Card: 36p QSFP 40G (36p line rate)
Cisco Nexus 9000 Series Spine Switches (Fixed)	
N9K-C9336PQ	ACI Ready Spine: 36p QSFP; incl 2 Power Supplies & 3 Fan Trays
Cisco Nexus 9000 Series Leaf Switches (Fixed)	
N9K-C93180LC-EX	Nexus 93180LC-EX switch, 24p 40/50 QSFP+ & 6p 100G QSFP28
N9K-C93180YC-EX	Nexus 93180YC-EX switch, 48p 1/10/25G SFP+ & 6p 100G QSFP28
N9K-C93108TC-EX	Nexus 93108TC-EX switch, 48p 1/10BASE-T & 6p 100G QSFP28
N9K-C9396PX	Nexus 9396PX switch, 960G, 48p 10G SFP+ & up to 12p 40G QSFP+

Part Number	Product Description
N9K-C9396TX	Nexus 9396TX switch, 960G, 48p 1/10G-T & up to 12p 40G QSFP+
N9K-C93128TX	Nexus 93128TX switch, 1,280G, 96p 1/10G-T & up to 8p 40G QSFP+
N9K-C93120TX	Nexus 93120tx switch, 96-port 1/10BASE-T and up to 6p 40 Gigabit Ethernet QSFP+
N9K-C9372PX-E	Nexus 9372PX-E switch, 48p 1/10G SFP+ & 6p 40G ports QSFP+
N9K-C9372TX-E	Nexus 9372TX-E switch, 48p 10G BASE-T & 6p 40G ports QSFP+
N9K-C9372PX	Nexus 9372PX, 48p 10G SFP+ & up to 6p 40G QSFP+
N9K-C9372TX	Nexus 9372TX, 48p 1/10G-T & up to 6p 40G QSFP+
N9K-C9332PQ	Nexus 9332PQ 32p 40G QSFP
Cisco Nexus 9000 Series Leaf Switches: Cisco ACI Software Licenses	
ACI-N9K-48X(=)	ACI SW license for a 48p 1/10G Nexus 9K
ACI-N9K-96X(=)	ACI SW license for a 96p 1/10G Nexus 9K
ACI-N9K-32PQ(=)	ACI SW license for 32p 40G Nexus 9K
Cisco Nexus 2000 Series Fabric Extenders: Cisco ACI Software Licenses	
ACI-F16G=	ACI SW license for a 16p 1/10G Nexus 2k (B22 FEX)
ACI-F48G=	ACI SW license for a 48p 1G Nexus 2K
ACI-F32X=	ACI SW license for a 32p 1/10G Nexus 2K
ACI-F48X=	ACI SW license for a 48p 1/10G Nexus 2K

Cisco ACI Ecosystem Integration

The APIC framework enables broad ecosystem and industry interoperability with Cisco ACI. It enables interoperability between a Cisco ACI environment and management, orchestration, virtualization, and L4-L7 services from a broad range of vendors.

The infrastructure controller provides centralized access to Cisco ACI through an object-oriented REST API framework with XML and JSON binding. It also supports a modernized, user-extensible CLI and GUI. APIs have full read and write access to Cisco ACI, providing tenant- and application-aware programmability, automation, and system access.

For the latest information about integration with Cisco ACI ecosystem partners and supported versions, please refer to the Cisco ACI compatibility matrix in the [Cisco ACI L4-L7 compatibility list solution overview](#).

Service and Support

Cisco offers a wide range of services to help accelerate your success in deploying and optimizing the Cisco ACI deployment in your data center. The innovative Cisco Services offerings are delivered through a unique combination of people, processes, tools, and partners and are focused on helping you increase operation efficiency and improve your data center network. Cisco Advanced Services use an architecture-led approach to help you align your data center infrastructure with your business goals and achieve long-term value. Cisco SMARTnet™ Service helps you resolve mission-critical problems with direct access at any time to Cisco network experts and award-winning resources. With this service, you can take advantage of the Cisco Smart Call Home service capability, which offers proactive diagnostics and real-time alerts on your Cisco ACI deployment. Spanning the entire network lifecycle, Cisco Services offerings help increase investment protection, optimize network operations, support migration operations, and strengthen your IT expertise.

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Cisco Capital can help you acquire the technology you need to achieve your objectives and stay competitive. We can help you reduce CapEx. Accelerate your growth. Optimize your investment dollars and ROI. Cisco Capital financing gives you flexibility in acquiring hardware, software, services, and complementary third-party equipment. And there's just one predictable payment. Cisco Capital is available in more than 100 countries. [Learn more.](#)

For More Information

For more information about Cisco ACI, please visit <http://www.cisco.com/go/aci>.



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