Verified Scalability Guide for Cisco APIC, Release 4.2(6), Multi-Site, Release 3.1(1), and Cisco Nexus 9000 Series ACI-Mode Switches, Release 14.2(6)

Overview 2

General Scalability Limits 2

Multiple Fabric Options Scalability Limits 5

Cisco ACI vPod Scalability Limits 6

Cisco ACI Multi-Site Scalability Limits 7

Fabric Topology, SPAN, Tenants, Contexts (VRFs), External EPGs, Bridge Domains, Endpoints, and Contracts Scalability Limits 9

VMM Scalability Limits 30

Layer 4 - Layer 7 Scalability Limits 33

AD, TACACS, RBAC Scalability Limits 33

Cisco Mini ACI Fabric and Virtual APICs Scalability Limits 34

Cisco Cloud APIC Scalability Limits 34

Cisco ACI and UCSM Scalability 35

QoS Scalability Limits 36

PTP Scalability Limits 36

Revised: June 4, 2025

Overview

This guide contains the maximum verified scalability limits for Cisco Application Centric Infrastructure (Cisco ACI) parameters in the following releases:

- Cisco Application Policy Infrastructure Controller (Cisco APIC), Release 4.2(5)
- Cisco ACI Multi-Site, Release 3.0(3)
- Cisco Nexus 9000 Series ACI-Mode Switches, Release 14.2(5)

These values are based on a profile where each feature was scaled to the numbers specified in the tables. These numbers do not represent the theoretically possible Cisco ACI fabric scale.

General Scalability Limits

- **L2 Fabric:** In Legacy mode there is no routing, L3 context, nor contract enabled in the L2 fabric profile. A tenant in this profile does not need to be mapped to one dedicated ACI tenant. A tenant can be represented by a set of EPGs instead. To improve the load sharing among APIC controller nodes, you must distribute EPGs and BDs across different ACI tenants.
- **L3 Fabric:** The ACI L3 fabric solution provides a feature-rich highly scalable solution for public cloud and large enterprise. With this design, almost all supported features are deployed at the same time and are tested as a solution. The scalability numbers listed in this section are multi-dimensional scalability numbers. The fabric scalability numbers represent the overall number of objects created on the fabric. The per-leaf scale numbers are the objects created and presented on an individual leaf switch. The fabric level scalability numbers represent APIC cluster scalability and the tested upper limits. Some of the per-leaf scalability numbers are subject to hardware restrictions. The per-leaf scalability numbers are the maximum limits tested and supported by leaf switch hardware. This does not necessarily mean that every leaf switch in the fabric was tested with maximum scale numbers.
- **Stretched Fabric:** Stretched fabric allows multiple fabrics (up to 3) distributed in multiple locations to be connected as a single fabric with a single management domain. The scale for the entire stretched fabric remains the same as for a single site fabric. For example a L3 stretched fabric will support up to 400 leaf switches total which is the maximum number of leaf switches supported on a single site fabric. Parameters only relevant to stretched fabric are mentioned in the tables below.
- **Multi-Pod:** Multi-Pod enables provisioning a more fault-tolerant fabric comprised of multiple Pods with isolated control plane protocols. Also, Multi-Pod provides more flexibility with regard to the full mesh cabling between leaf and spine switches. For example, if leaf switches are spread across different floors or different buildings, Multi-Pod enables provisioning multiple Pods per floor or building and providing connectivity between Pods through spine switches.

  Multi-Pod uses a single APIC cluster for all the Pods; all the Pods act as a single fabric. Individual APIC controllers are placed across the Pods but they are all part of a single APIC cluster.
- **Multi-Site**: Multi-Site is the architecture interconnecting and extending the policy domain across multiple APIC cluster domains. As such, Multi-Site could also be named as Multi-Fabric, since interconnects separate Availability Zones (Fabrics) and managed by an independent APIC controller cluster. An ACI Multi-Site Orchestrator is part of the architecture and is used to communicate with the different APIC domains to simplify the management of the architecture and the definition of inter-site policies.

Leaf Switches and Ports

The maximum number of leaf switches is 400 per Pod and 500 total in Multi-Pod fabric. The maximum number of physical ports is 24,000 per fabric. The maximum number of remote leaf (RL) switches is 128 per fabric, with total number of BDs deployed on all remote leaf switches in the fabric not exceeding 60,000. The total number of BDs on all RLs is equal to the sum of BDs on each RL.

If Remote Leaf Pod Redundancy policy is enabled, we recommended that you disable the `Pre-emption` flag in the APIC for all scaled up RL deployments. In other words, you must wait for BGP CPU utilization to fall under 50% on all spine switches before you initiate pre-emption.

Breakout Ports

The N9K-C9336C-FX2 switch supports up to 34 breakout ports in both 10G or 25G mode.

General Scalability Limits

Configurable Options	L2 Fabric	L3 Fabric	Large L3 Fabric
Number of APIC controllers **Note** * denotes preferred cluster size. While the higher number of controllers is supported, the preferred size is based on the number of leaf switches in the environment.	3* or 4 node APIC cluster	3* or 4 node APIC cluster	5*, 6, or 7 node APIC cluster
Number of leaf switches	80	80 for 3-node cluster 200 for 4-node cluster	300 for 5- or 6-node cluster 500 for 7-node cluster
Number of tier-2 leaf switches per Pod in Multi-Tier topology **Note** The total number of leaf switches from all tiers should not exceed the "Number of leaf switches" listed above	80	80 for 3-node cluster 100 for 4-node cluster	100
Number of spine switches	Maximum spines per Pod: 6. Total spines per fabric: 24.	Maximum spines per Pod: 6. Total spines per fabric: 24.	Maximum spines per Pod: 6. Total spines per fabric: 24.
Number of FEXs	20 FEXs per leaf switch 576 ports per leaf switch 650 FEXs per fabric	20 FEXs per leaf switch 576 ports per leaf switch 650 FEXs per fabric	20 FEXs per leaf switch 576 ports per leaf switch 650 FEXs per fabric
Number of tenants	1,000	1,000	3,000
Number of Layer 3 (L3) contexts (VRFs)	N/A	1,000	3,000

Configurable Options	L2 Fabric	L3 Fabric	Large L3 Fabric
Number of contracts/filters	N/A	• 10,000 contracts • 10,000 filters	• 10,000 contracts • 10,000 filters
Number of endpoint groups (EPGs)	For a fabric with a single Tenant: 4,000 For a fabric with multiple Tenants: 500 per Tenant, up to 21,000 total across all Tenants	For a fabric with a single Tenant: 4,000 For a fabric with multiple Tenants: 500 per Tenant, up to 15,000 total across all Tenants	For a fabric with a single Tenant: 4,000 For a fabric with multiple Tenants: 500 per Tenant, up to 15,000 total across all Tenants
Number of Isolation enabled EPGs	400	400	400
Number of bridge domains (BDs)	21,000	15,000	15,000
Number of OSPF sessions + EIGRP (for external connection)	N/A	3,000	3,000
Number of Multicast routes	N/A	32,000	32,000
Number of Multicast routes per VRF	N/A	32,000	32,000
Number of static routes to a single SVI/VRF	N/A	5,000	5,000
Number of static routes on a single leaf switch	N/A	10,000	10,000
Number of vCenters	N/A	• 200 VDS • 50 AVS • 50 Cisco ACI Virtual Edge	• 200 VDS • 50 AVS • 50 Cisco ACI Virtual Edge
Number of Service Chains	N/A	1,000	1,000
Number of L4 - L7 devices	N/A	30 managed or 50 unmanaged physical HA pairs, 1,200 virtual HA pairs (1,200 maximum per fabric)	30 managed or 50 unmanaged physical HA pairs, 1,200 virtual HA pairs (1,200 maximum per fabric)
Number of ESXi hosts - VDS	N/A	3,200	3,200
Number of ESXi hosts - AVS	N/A	3,200 (Only 1 AVS instance per host)	3,200 (Only 1 AVS instance per host)
Number of ESXi hosts - AVE	N/A	3,200 (Only 1 AVE instance per host)	3,200 (Only 1 AVE instance per host)
Number of VMs	N/A	Depends upon server scale	Depends upon server scale

Configurable Options	L2 Fabric	L3 Fabric	Large L3 Fabric
Number of configuration zones per fabric	30	30	30
Number of BFD sessions per leaf switch	256 Minimum BFD timer required to support this scale: • `minTx:50` • `minRx:50` • `multiplier:3`	256 Minimum BFD timer required to support this scale: • `minTx:50` • `minRx:50` • `multiplier:3`	256 Minimum BFD timer required to support this scale: • `minTx:50` • `minRx:50` • `multiplier:3`
Multi-Pod **Note** * denotes preferred cluster size.	• 3* or 4 node APIC cluster • 6 Pods • 80 leaf switches overall	• 3* or 4 node APIC cluster • 6 Pods • 80 for 3-node cluster 200 for 4-node cluster	• 5* or 6 node APIC cluster,6 Pods, 200 leaf switches max per Pod, 300 leaf switches max overall • 7 node APIC cluster,12 Pods, 400 leaf switches max per Pod, 500 leaf switches max overall
L3 EVPN Services over Fabric WAN - GOLF (with and without OpFlex)	N/A	1000 VRFs, 60,000 routes in a fabric	1000 VRFs, 60,000 routes in a fabric
Layer 3 Multicast routes	N/A	32,000	32,000
Number of Routes in Overlay-1 VRF	1,000	1,000	1,000

Multiple Fabric Options Scalability Limits

Stretched Fabric

Configurable Options	Per Fabric Scale
Maximum number of fabrics that can be a stretched fabric	3
Maximum number of Route Reflectors	6

Multi-Pod

Configurable Options	Per Fabric Scale
Maximum number of Pods	12

Configurable Options	Per Fabric Scale
Maximum number of leaf switches per Pod	400
Maximum number of leaf switches overall	500
Maximum number of Route Reflectors for L3Out	24
Number of External Route Reflectors between Pods	• **For 1-3 Pods**: Up to 3 external route reflectors We recommend full mesh for external BGP peers instead of using external route reflectors when possible • **For 4 or more Pods**: Up to 4 external route reflectors We recommend using external route reflectors instead of full mesh We recommend that the external route reflectors are distributed across Pods so that in case of any failure there are always at least two Pods with external route reflectors still reachable

Cisco ACI vPod Scalability Limits

Cisco ACI vPod Scalability Limits

Configurable Options	Scale
Number of vPods	6
Number of Cisco ACI Virtual Edge (AVE) instances per vPod	32
Number of Virtual Ethernet Ports (vEThs) per AVE in vPod	32
Number of EPGs per vPod	256
Number of EPGs across all vPods	864
Number of EPGs across all physical and virtual pods	15,000
Number of filters per ACI Virtual Edge	128
Number of contracts per ACI Virtual Edge *The total number of filters used by all contracts must not exceed the filter limit above	36

Cisco ACI Multi-Site Scalability Limits

Stretched Vs. Non-Stretched

Stretched in Multi-Site means that the fabric has stretched objects such as EPGs, BDs, VRFs, or subnets across multiple sites or has cross-site contracts between EPGs.

Non-Stretched in Multi-Site means all objects such as EPG, contract, and BD are local to a site only and do not cross the local-site boundary.

The total number of stretched and non-stretched objects must not exceed the maximum verified scalability limit for that object, which are listed in their respective sections in this guide.

Note For maximum scale Multi-Site configurations with many features enabled simultaneously, it is recommended that those configurations be tested in a lab before deployment.

Multi-Site General Scalability Limits

Configurable Options	Scale
Sites	12
Pods per site	12
Leaf switches per site	400 in a single pod 500 across all pods in Multi-Pod fabrics

Multi-Site Object Scale

Configurable Options	Scale
Policy Objects per Schema	1,000
Templates per Schema	10
Number of Schemas	80
Application Profiles per Schema	200
Contract Preferred Group (BD/EPG combinations)	500
Multi-Site Orchestrator Users (nonparallel*) *Multi-Site Orchestrator processes requests sequentially from multiple users even if they are deploying different schemas.	50

Multi-Site Scalability Limits for Stretched Objects

Configurable Options	Scale (Stretched)
Tenants	400
VRFs	1,000
BDs	4,000
Contracts	4,000
Endpoints	150,000 including: • 100,000 - learned from other sites • 50,000 - locally learned in site-local
EPGs	4,000
Isolated EPGs	400
Microsegment EPGs	400
IGMP Snooping	8,000
Layer-3 multicast routes	8,000
L3Out external EPGs	500
Subnets	8,000
Number of L4-L7 logical devices	400
Number of graph instances	250
Number of device clusters per tenant	10
Number of interfaces per device cluster	Any
Number of graph instances per device cluster	125

Multi-Site VRF/BD VNID Translation Scale

Configurable Options	Scale
Fixed spines	21,000
Modular spines	42,000

Fabric Topology, SPAN, Tenants, Contexts (VRFs), External EPGs, Bridge Domains, Endpoints, and Contracts Scalability Limits

The following table shows the mapping of the "ALE/LSE Type" to the corresponding ToR switches. This information is helpful to determine which ToR switch is affec4ted when we use the terms ALE v1, ALE v2, LSE, or LSE2 in remaining sections.

Note In the following table, the N9K-C9336C-FX2 and N9K-C93360YC-FX2 switches are listed as LSE for scalability limits purposes only; the switches support LSE2 platform features. Consult specific feature documentation for the full list of supported devices.

ALE/LSE Type	ACI-Supported ToR switches
ALE v1	• N9K-C9396PX + N9K-M12PQ • N9K-C93128TX + N9K-M12PQ • N9K-C9396TX + N9K-M12PQ
ALE v2	• N9K-C9396TX + N9K-M6PQ • N9K-C93128TX + N9K-M6PQ • N9K-C9396PX + N9K-M6PQ • N9K-C9372TX 64K • N9K-C9332PQ • N9K-C9372PX
LSE	N9K-C93108TC-EX N9K-C93180YC-EX N9K-C93180LC-EX N9K-C9336C-FX2 N9K-C93216TC-FX2 N9K-C93240YC-FX2 N9K-C93360YC-FX2
LSE2	N9K-C93108TC-FX N9K-C93180YC-FX N9K-C9348GC-FXP N9K-C93600CD-GX N9K-C9364C-GX

Note Unless explicitly called out, LSE represents both LSE and LSE2 and ALE represents both ALE v1 and ALE v2 in the rest of this document.

Note The High Policy Profile listed in the following sections is supported only on Cisco Nexus N9K-C93180YC-FX, N9K-C93600CD-GX, and N9K-C9364C-GX switches with 32GB of RAM.

Fabric Topology

Configurable Options	Per Leaf Scale	Per Fabric Scale
Number of PCs, vPCs	320 (with FEX HIF)	N/A
Number of encapsulations per access port, PC, vPC (non-FEX HIF)	3,000	N/A
Number of encapsulations per FEX HIF, PC, vPC	20	N/A
Number of member links per PC, vPC* *vPC total ports = 32, 16 per leaf	16	N/A
Number of ports x VLANs (global scope and no FEX HIF)	64,000 168,000 (when using legacy BD mode)	N/A
Number of ports x VLANs (FEX HIFs and/or local scope)	For ALE v1 and v2: 9,000 For LSE and LSE2: 10,000	N/A
Number of static port bindings	For ALE v1 and v2: 30,000 For LSE and LSE2: 60,000	400,000
Number of VMACs	For ALE v2: 255 For LSE and LSE2: 510	N/A
STP	All VLANs	N/A
Mis-Cabling Protocol (MCP)	256 VLANs per interface 2,000 logical ports (port x VLAN) per leaf	N/A

Configurable Options	Per Leaf Scale	Per Fabric Scale
Maximum number of endpoints (EPs)		16-slot and 8-slot modular spine switches: Max. 450,000 Proxy Database Entries in the fabric, which can be translated into any one of the following: • 450,000 MAC-only EPs (each EP with one MAC only) • 225,000 IPv4 EPs (each EP with one MAC and one IPv4) • 150,000 dual-stack EPs (each EP with one MAC, one IPv4, and one IPv6) The formula to calculate in mixed mode is as follows: #MAC + #IPv4 + #IPv6 <= 450,000 NOTE: Four fabric modules are required on all spines in the fabric to support above scale.

Configurable Options	Per Leaf Scale	Per Fabric Scale
		4-slot modular spine switches: Max. 360,000 Proxy Database Entries in the fabric, which can be translated into any one of the following: • 360,000 MAC-only EPs (each EP with one MAC only) • 180,000 IPv4 EPs (each EP with one MAC and one IPv4) • 120,000 dual-stack EPs (each EP with one MAC, one IPv4, and one IPv6) The formula to calculate in mixed mode is as follows: #MAC + #IPv4 + #IPv6 <= 360,000 NOTE: Four fabric modules are required on all spines in the fabric to support above scale.

Configurable Options	Per Leaf Scale	Per Fabric Scale
		Fixed spine switches: Max. 180,000 Proxy Database Entries in the fabric, which can be translated into any one of the following: • 180,000 MAC-only EPs (each EP with one MAC only) • 90,000 IPv4 EPs (each EP with one MAC and one IPv4) • 60,000 dual-stack EPs (each EP with one MAC, one IPv4, and one IPv6) The formula to calculate in mixed mode is as follows: #MAC + #IPv4 + #IPv6 <= 180,000

Configurable Options	Per Leaf Scale	Per Fabric Scale
	Default (Dual Stack) profile: • ALE v1 and v2: • MAC: 12,000 • IPv4: 12,000 or • IPv6: 6,000 or • IPv4: 4,000 IPv6: 4,000 Default profile or High LPM profile: • LSE or LSE2: • MAC: 24,000 • IPv4: 24,000 • IPv6: 12,000 IPv4 scale profile: • LSE and LSE2: • MAC: 48,000 • IPv4: 48,000 • IPv6: Not supported • ALE v1 and v2: Not supported High Dual Stack scale profile: • LSE: • MAC: 64,000 • IPv4: 64,000 • IPv6: 24,000 • LSE2: • MAC: 64,000 • IPv4: 64,000 • IPv6: 48,000 • ALE v1 and v2: Not supported High Policy profile:	

Configurable Options	Per Leaf Scale	Per Fabric Scale

	• LSE2 (N9K-C93180YC-FX, N9K-C93600CD-GX, and N9K-C9364C-GX switches with 32GB of RAM only):
	  • MAC: 24,000
	  • IPv4: 24,000
	  • IPv6: 12,000	

Number of Multicast Routes	Default (dual stack), IPv4, or High LPM scale profile: 8,000 with (S,G) scale not exceeding 4,000 High Dual stack Scale profile: • LSE: 512 • LSE2: 32,000 with (S,G) scale not exceeding 16,000 High Policy profile: • LSE2 (N9K-C93180YC-FX, N9K-C93600CD-GX, and N9K-C9364C-GX switches with 32GB of RAM only): 8,000 with (S,G) scale not exceeding 4,000	32,000
Number of Multicast Routes per VRF	Default (dual stack), IPv4, or High LPM scale profile: 8,000 with (S,G) scale not exceeding 4,000 High Dual stack Scale profile: • LSE: 512 • LSE2: 32,000 with (S,G) scale not exceeding 16,000 High Policy profile: • LSE2 (N9K-C93180YC-FX, N9K-C93600CD-GX, and N9K-C9364C-GX switches with 32GB of RAM only): 8,000	32,000
IGMP snooping L2 multicast routes • For IGMPv2, route scale is for (*, G) only • For IGMPv3, route scale is for both (S, G) and (*, G) **Note** IGMP snooping entries are created per BD (2 receivers that join the same group from 2 different BDs consume 2 separate entries).	Default (Dual Stack), IPv4, High LPM, High Policy, or High IPv4 EP scale profiles: 8,000 High Dual Stack profile: • LSE: 512 • LSE2: 32,000 Multicast Heavy profile: • LSE: not supported • LSE2: 32,000	32,000

Configurable Options	Per Leaf Scale	Per Fabric Scale
Number of IPs per MAC	4,096	4,096
Number of Host-Based Routing Advertisements	30,000 host routes per border leaf	N/A
SPAN	ALE-based ToR switches: • 4 unidirectional or 2 bidirectional access/tenant sessions • 4 unidirectional or 2 bidirectional fabric sessions LSE-based ToR switches: • 32 unidirectional or 16 bidirectional sessions (fabric, access, or tenant)	N/A
Number of ports per SPAN session **Note** This is also the total number of unique ports (fabric and access) that can be used as SPAN sources across all SPAN sessions combined	ALE-based ToR switches: • All leaf access ports could be in one session. • All leaf fabric ports could be in one session. LSE/LSE2-based ToR switches: • 63 – total number of unique ports (fabric + access) across all types of span sessions	N/A

Configurable Options	Per Leaf Scale	Per Fabric Scale
Number of SPAN sources in each direction	ALE-based leaf switches: • 2* (V + FP + AP1 + AP2 + (V*AP1)) <= 460 (ingress direction) • 2* (V + FP + AP1 + AP2 + (V*AP1)) <= 100 (egress direction) LSE-based leaf switches: • 2* (V + FP + AP1 + AP2 + (V*AP1) + AP3_v6) + AP3_v4 <= 480 (for each direction) Where: • V: Number of source VLANS in Tenant SPAN. Each source EPG may contain multiple VLANS. • FP: Number of source ports in Fabric SPAN • AP1: Number of source ports in Access SPAN without any filters • AP2: Number of (VLAN, Port) pairs in Access SPAN with EPG/L3Out filters. Each EPG/L3Out may contain mutiple VLANs. • V*AP1: When both "V" and "AP1" are configured, additional entries are created for each (V, AP1) pair. • AP3_v6: Number of (IPv6 filter entry, Port) pairs in Access SPAN with Filter Group • AP3_v4: Number of (IPv4 filter entry, Port) pairs in Access SPAN with Filter Group	N/A
Maximum number of L4 Port Ranges	16 (8 source and 8 destination) First 16 port ranges consume a TCAM entry per range. Each additional port range beyond the first 16 consumes a TCAM entry per port in the port range. Filters with distinct source port range and destination port range count as 2 port ranges. You cannot add more than 16 port ranges at once.	N/A
Common pervasive gateway	256 virtual IPs per Bridge Domain	N/A

Configurable Options	Per Leaf Scale	Per Fabric Scale
Maximum number of Data Plane policers at the interface level	ALE: • 64 ingress policers • 64 egress policers LSE and LSE2: • 7 ingress policers • 3 egress policers	N/A
Maximum number of Data Plane policers at EPG and interface level	128 ingress policers	N/A
Maximum number of interfaces with Per-Protocol Per-Interface (PPPI) CoPP	63	N/A
Maximum number of TCAM entries for Per-Protocol Per-Interface (PPPI) CoPP	256 One PPPI CoPP configuration may use more than one TCAM entry. The number of TCAM entries used for each configuration varies in each protocol and leaf platform. Use `vsh_lc -c 'show system internal aclqos pppi copp tcam-usage'` command to check on LSE/LSE2 platforms	N/A
Maximum number of SNMP trap receivers	10	10
IP SLA probes* *With 1 second probe time and 3 seconds of timeout	100	400
First Hop Security (FHS)* With any combination of BDs/EPGs/EPs within the supported limit	2,000 endpoints 1,000 bridge domains	N/A
Maximum number of Q-in-Q tunnels (both QinQ core and edge combined)	1,980	N/A
Maximum number of TEP-to-TEP atomic counters (tracked by 'dbgAcPathA' object)	N/A	1,600

Tenants

Configurable Options	Per Leaf Scale	Per Fabric Scale
Number of Contexts (VRFs) per tenant	ALE: 50 LSE: 128	ALE: 50 LSE: 128

VRFs (Contexts)

All numbers are applicable to dual stack unless explicitly called out.

Configurable Options	Per Leaf Scale	Per Fabric Scale
Maximum number of Contexts (VRFs)	ALE: 400 LSE and LSE2: 800	3,000
Maximum ECMP (equal cost multipath) for BGP best path	64	N/A
Maximum ECMP (equal cost multipath) for OSPF best path	64	N/A
Maximum ECMP (equal cost multipath) for Static Route best path	64	N/A
Number of isolated EPGs	400	400
Border Leafs per L3 Out	N/A	12
Maximum number of vzAny Provided Contracts	Shared services: Not supported Non-shared services: 70 per Context (VRF)	N/A
Maximum number of vzAny Consumed Contracts	Shared services: 16 per Context (VRF) Non-shared services: 70 per Context (VRF)	N/A
Number of Graphs Instances per device cluster	N/A	500
L3 Out per context (VRF)	N/A	400
Maximum number of BGP neighbors	400	10,000
Maximum number of OSPF neighbors	300 (Maximum number of VRFs with an l3out where OSPF is the only routing protocol enabled, cannot exceed 142)	N/A
Maximum number of EIGRP neighbors	32	N/A

Configurable Options	Per Leaf Scale	Per Fabric Scale
Maximum number of IP Longest Prefix Matches (LPM) entries **Note** The total of `(# of IPv4 prefixes) + 2*(# of IPv6 prefixes)` must not exceed the scale listed for IPv4 alone	Default (Dual Stack) profile: • For ALE v1 and v2: • IPv4: 10,000 or • IPv6: 6,000 or • IPv4: 4,000, IPv6: 4,000 • IPv6 wide prefixes (> /64): 1,000 • For LSE or LSE2: • IPv4: 20,000 or • IPv6: 10,000 • IPv6 wide prefixes (>= /84): 1,000 NOTE: For LSE2 and FX2 models there's no restriction on wide prefixes. IPv4 scale profile: • For LSE or LSE2: • IPv4: 38,000 • IPv6: Not supported • For ALE v1 and v2: Not supported High Dual Stack scale profile: • For LSE or LSE2: • IPv4: 38,000 or • IPv6: 19,000 • IPv6 wide prefixes (>= /84): 1,000 NOTE: For LSE2 and FX2 models there's no restriction on wide prefixes. • For ALE v1 and v2: Not supported	N/A

Configurable Options	Per Leaf Scale	Per Fabric Scale
Maximum number of IP Longest Prefix Matches (LPM) entries (Continued) **Note** The total of `(# of IPv4 prefixes) + 2*(# of IPv6 prefixes)` must not exceed the scale listed for IPv4 alone	High LPM Scale profile – • LSE or LSE2: • IPv4: 128,000 or • IPv6: 64,000 • IPv6 wide prefixes (>= /84): 1,000 NOTE: For LSE2 and FX2 models there's no restriction on wide prefixes. • ALE v1 and v2: Not supported High Policy profile: • LSE2 (N9K-C93180YC-FX, N9K-C93600CD-GX, and N9K-C9364C-GX switches with 32GB of RAM only): • IPv4: 20,000 or • IPv6: 10,000	N/A
Maximum number of Secondary addresses per logical interface	1	1
Maximum number of L3 interfaces per Context	• 1,000 SVIs • 8 Routed interfaces • 100 sub-interfaces with or without port-channel	N/A
Maximum number of L3 interfaces	• 1,000 SVIs • 8 Routed interfaces • 1,000 sub-interfaces with or without port-channel	N/A
Maximum number of ARP entries for L3 Outs	7,500	N/A
Shared L3 Out	• IPv4 Prefixes: 2,000 or • IPv6 Prefixes: 1,000	• IPv4 Prefixes: 6,000 or • IPv6 Prefixes: 3,000

Configurable Options	Per Leaf Scale	Per Fabric Scale
Maximum number of L3 Outs	400 For LSE and LSE2: 800	2,400 (single-stack) 1,800 (dual-stack)

External EPGs

Configurable Options	Per Leaf Scale	Per Fabric Scale
Number of External EPGs	800	ALE: 2,400 LSE: 4,000 The listed scale is calculated as a product of (Number of external EPGs)*(Number of border leaf switches for the L3Out) For example, the following combination adds up to a total of 2,000 external EPGs in the fabric (250 external EPGs * 2 border leaf switches * 4 L3Outs): • 250 External EPGs in `L3Out1` on `leaf1` and `leaf2` • 250 External EPGs in `L3Out2` on `leaf1` and `leaf2`. • 250 External EPGs in `L3Out3` on `leaf3` and `leaf4` • 250 External EPGs in `L3Out4` on `leaf3` and `leaf4`
Number of External EPGs per L3Out	250	600 The listed scale is calculated as a product of (Number of external EPGs per L3Out)*(Number of border leaf switches for the L3Out) For examples, 150 external EPGs on `L3Out1` that is deployed on `leaf1`, `leaf2`, `leaf3`, and `leaf4` adds up to a total of 600
Maximum number of LPM Prefixes for External EPG Classification **Note** Maximum combined number of IPv4/IPv6 host and LPM prefixes for External EPG Classification must not exceed 64,000	ALE: 1,000 IPv4 LSE: refer to LPM scale section.	N/A

Configurable Options	Per Leaf Scale	Per Fabric Scale
Maximum number of host prefixes for External EPG Classification **Note** Maximum combined number of IPv4/IPv6 host and LPM prefixes for External EPG Classification must not exceed 64,000		N/A

Configurable Options	Per Leaf Scale	Per Fabric Scale
	ALE: 1,000 LSE and LSE2: • Default Profile: • IPv4 (/32): 16,000 • IPv6 (/128): 12,000 Combined number of host prefixes and endpoints can't exceed 12,000. • IPv4 Profile: • IPv4 (/32): 16,000 Combined number of host prefixes, mcast routes, and endpoints can't exceed 56,000. • IPv6 (/128): 0 • High Dual Stack Profile: • IPv4 (/32): 64,000 Combined number of host prefixes, mcast routes, and endpoints can't exceed 64,000. • IPv6 (/128): 24,000 (LSE) Combined number of host prefixes and endpoints can't exceed 24,000. • IPv6 (/128): 48,000 (LSE2 only) Combined number of host prefixes and endpoints can't exceed 48,000. • High LPM Profile: • IPv4 (/32): 24,000 Combined number of host prefixes, mcast routes, and endpoints can't exceed 24,000. • IPv6 (/128): 12,000 Combined number of host prefixes and endpoints can't exceed 12,000.	

Configurable Options	Per Leaf Scale	Per Fabric Scale

	• High Policy profile (N9K-C93180YC-FX, N9K-C93600CD-GX, and N9K-C9364C-GX switches with 32GB of RAM only):
	  • IPv4 (/32): 16,000
	  • IPv6 (/128): 12,000
	  Combined number of host prefixes and endpoints can't exceed 12,000.	

Bridge Domains

Configurable Options	Per Leaf Scale	Per Fabric Scale
Maximum number of BDs	1,980 Legacy mode: 3,500 On ALE ToR switches with multicast optimized mode: 50	15,000
Maximum number of BDs with Unicast Routing per Context (VRF)	ALE: 256 LSE: 1,000	1,750
Maximum number of subnets per BD	1,000, cannot be for all BDs.	1,000 per BD
Maximum number of EPGs per BD	3,960	4,000
Number of L2 Outs per BD	1	1
Number of BDs with Custom MAC Address	1,000 On ALE ToR switches with multicast optimized mode: 50	1,000 On ALE ToR switches with multicast optimized mode: 50
Maximum number of EPGs + L3 Outs per Multicast Group	128	128
Maximum number of BDs with L3 Multicast enabled	1,750	1,750
Maximum number of VRFs with L3 Multicast enabled	64	300
Maximum number of L3 Outs per BD	ALE: 4 LSE: 16	N/A

Configurable Options	Per Leaf Scale	Per Fabric Scale
Number of static routes behind pervasive BD (EP reachability)	N/A	450
DHCP relay addresses per BD across all labels	16	N/A
Number of external EPGs per L2 out	1	1
Maximum number of PIM Neighbors	1,000	1,000
Maximum number of PIM Neighbors per VRF	64	64
Maximum number of L3Out physical interfaces with PIM enabled	32	N/A

Endpoint Groups (Under App Profiles)

Configurable Options	Per Leaf Scale	Per Fabric Scale
Maximum number of EPGs	Normally 3,960; if legacy mode 3,500	15,000
Maximum amount of encapsulations per EPG	1 Static leaf binding, plus 10 Dynamic VMM	N/A
Maximum Path encap binding per EPG	Equals to number of ports on the leaf	N/A
Maximum amount of encapsulations per EPG per port with static binding	One (path or leaf binding)	N/A
Maximum number of domains (physical, L2, L3)	100	N/A
Maximum number of VMM domains	N/A	• 200 VDS • 50 AVS • 50 Cisco ACI Virtual Edge
Maximum number of native encapsulations	• One per port, if a VLAN is used as a native VLAN. • Total number of ports, if there is a different native VLAN per port.	Applicable to each leaf independently
Maximum number of 802.1p encapsulations	• 1, if path binding then equals the number of ports. • If there is a different native VLAN per port, then it equals the number of ports.	Applicable to each leaf independently

Configurable Options	Per Leaf Scale	Per Fabric Scale
Can encapsulation be tagged and untagged?	No	N/A
Maximum number of Static endpoints per EPG	Maximum endpoints	N/A
Maximum number of Subnets for inter-context access per tenant	4,000	N/A
Maximum number of Taboo Contracts per EPG	2	N/A
IP-based EPG (bare metal)	4,000	N/A
MAC-based EPG (bare metal)	4,000	N/A

Contracts

Cisco ACI supports two types of compression for policy CAM (content-addressable memory):

- **Bidirectional compression** ensures that bidirectional rules consume a single entry in the policy CAM and is supported starting with Cisco APIC release 3.2(1).
- **Policy TCAM indirection compression** enables multiple contracts to refer to the same filter rules and is supported starting with Cisco APIC release 4.0(1).

If you enable compression in release 4.0(1) or later, APIC will use either or both optimizations depending on the configuration. When enabling compression on -EX switches, APIC will apply bidirectional compression. The policy TCAM compression feature requires -FX leaf switches or newer.

Configurable Options	Per Leaf Scale	Per Fabric Scale
Security TCAM size	Default scale profile: • For ALE v1: 4,000 • For ALE v2: 40,000 • For LSE and LSE2: 64,000 IPv4 scale profile: • For LSE and LSE2: 64,000 • For ALE v1/v2: N/A High Dual Stack scale profile: • For LSE: 8,000 • For LSE2: 128,000 • For ALE v1/v2: N/A High LPM scale profile: • For LSE and LSE2: 8,000 • For ALE v1/v2: N/A High Policy profile: • LSE2 (N9K-C93180YC-FX, N9K-C93600CD-GX, and N9K-C9364C-GX switches with 32GB of RAM only): 256,000	N/A
Software policy scale with Policy Table Compression enabled (Number of `actrlRule` Managed Objects)	Dual stack profile: • LSE (N9K-C9336C-FX2 only): 80,000 • LSE2 (N9K-C93180YC-FX only): 80,000 High Dual Stack profile: • LSE2 (N9K-C93180YC-FX, N9K-C93600CD-GX, and N9K-C9364C-GX only) : 140,000	N/A
Approximate TCAM calculator given contracts and their use by EPGs	Number of entries in a contract X Number of Consumer EPGs X Number of Provider EPGs X 2	N/A

Configurable Options	Per Leaf Scale	Per Fabric Scale
Number of consumers (or providers) of a contract that has more than 1 provider (or consumer)	100	100
Number of consumers (or providers) of a contract that has a single provider (or consumer)	1,000	1,000
Scale guideline for the number of Consumers and Providers for the same contract	N/A	Number of consumer EPGs * number of provider EPGs * number of filters in the contract <= 50,000
Maximum number of rules for consumer/provider relationships with in-band EPG	400	N/A
Maximum number of rules for consumer/provider relationships with out-of-band EPG	400	N/A

FCoE NPV

Configurable Options	Per Leaf Scale	Per Fabric Scale
Maximum number of VSANs	32	N/A
Maximum number of VFCs configured on physical ports and FEX ports	151	N/A
Maximum number of VFCs on port-channel (PC), including SAN port-channel	7	N/A
Maximum number of VFCs on virtual port-channel (vPC) interfaces, including FEX HIF vPC	151	N/A
Maximum number of FDISC per port	255	N/A
Maximum number of FDISC per leaf	1,000	N/A

FC NPV

Configurable Options	Per Leaf Scale	Per Fabric Scale
Maximum number of FC NP Uplink interfaces	48	N/A
Maximum number of VSANs	32	N/A
Maximum number of FDISC per port	255	N/A

Configurable Options	Per Leaf Scale	Per Fabric Scale
Maximum number of FDISC per leaf	1,000	N/A
Maximum number of SAN port-channel, including VFC port-channel	7	N/A
Maximum number of members in a SAN port-channel	16	N/A

VMM Scalability Limits

VMware

Configurable Options	Per Leaf Scale	Per Fabric Scale
Number of vCenters (VDS)	N/A	200 (Verified with a load of 10 events/minute for each vCenter)
Number of vCenters (AVS)	N/A	50
Number of vCenters (Cisco ACI Virtual Edge)	N/A	50
Datacenters in a vCenter	N/A	4
Total Number of VMM domain (vCenter, Datacenter) instances.	N/A	• 200 VDS • 50 AVS • 50 Cisco ACI Virtual Edge
Number of ESX hosts per AVS	240	N/A
Number of ESX hosts running Cisco ACI Virtual Edge	150	N/A
Number of EPGs per vCenter/vDS	N/A	5,000
Number of EPGs to VMware domains/vDS	N/A	5,000
Number of EPGs per vCenter/AVS	N/A	3,500
Number of EPGs to VMware domains/AVS	N/A	3,500
Number of EPGs per vCenter/Cisco ACI Virtual Edge	N/A	VLAN Mode: 1,300 VXLAN Mode: 2,000
Number of EPGs to VMware domains and Cisco ACI Virtual Edge	N/A	VLAN Mode: 1,300 VXLAN Mode: 2,000
Number of endpoints (EPs) per AVS	10,000	10,000

Configurable Options	Per Leaf Scale	Per Fabric Scale
Number of endpoints per VDS	10,000	10,000
Number of endpoints per vCenter	10,000	10,000
Number of endpoints per Cisco ACI Virtual Edge	10,000	10,000
Support RBAC for AVS	N/A	Yes
Support RBAC for VDS	N/A	Yes
Support RBAC for Cisco ACI Virtual Edge	N/A	Yes
Number of Microsegment EPGs with vDS	400	N/A
Number of Microsegment EPGs with AVS	1,000	N/A
Number of Microsegment EPGs with Cisco ACI Virtual Edge	1,000	N/A
Number of DFW flows per vEth with AVS	10,000	N/A
Number of DFW flows per vEth with Cisco ACI Virtual Edge	10,000	N/A
Number of DFW denied and permitted flows per ESX host with AVS	250,000	N/A
Number of DFW denied and permitted flows per ESX host with Cisco ACI Virtual Edge	250,000	N/A
Number of VMM domains per EPG with AVS	N/A	10
Number of VMM domains per EPG with Cisco ACI Virtual Edge	N/A	10
Number of VM Attribute Tags per vCenter	N/A	vCenter version 6.0: 500 vCenter version 6.5: 1,000

Microsoft SCVMM

Configurable Options	Per Leaf Scale (On-Demand Mode)	Per Leaf Scale (Pre-Provision Mode)	Per Fabric Scale
Number of controllers per SCVMM domain	N/A	N/A	5
Number of SCVMM domains	N/A	N/A	25

Configurable Options	Per Leaf Scale (On-Demand Mode)	Per Leaf Scale (Pre-Provision Mode)	Per Fabric Scale
EPGs per Microsoft VMM domain	N/A	N/A	3,000
EPGs per all Microsoft VMM domains	N/A	N/A	9,000
EP/VNICs per HyperV host	N/A	N/A	100
EP/VNICs per SCVMM	3,000	10,000	10,000
Number of Hyper-V hosts	64	N/A	N/A
Number of logical switch per host	N/A	N/A	1
Number of uplinks per logical switch	N/A	N/A	4
Microsoft micro-segmentation	1,000	Not Supported	N/A

Microsoft Windows Azure Pack

Configurable Options	Per Leaf Scale	Per Fabric Scale
Number of Windows Azure Pack subscriptions	N/A	1,000
Number of plans per Windows Azure Pack instance	N/A	150
Number of users per plan	N/A	200
Number of subscriptions per user	N/A	3
VM networks per Windows Azure Pack user	N/A	100
VM networks per Windows Azure Pack instance	N/A	3,000
Number of tenant shared services/providers	N/A	40
Number of consumers of shared services	N/A	40
Number of VIPs (Citrix)	N/A	50
Number of VIPs (F5)	N/A	50

Layer 4 - Layer 7 Scalability Limits

Configurable Options (L4-L7 Configurations)	Per Leaf Scale	Per Fabric Scale
Maximum number of L4-L7 logical device clusters	N/A	1,200
Maximum number of graph instances	N/A	1,000
Number of device clusters per tenant	N/A	30
Number of interfaces per device cluster	N/A	Any
Number of graph instances per device cluster	N/A	500
Deployment scenario for ASA (transparent or routed)	N/A	Yes
Deployment scenario for Citrix - One arm with SNAT/etc.	N/A	Yes
Deployment scenario for F5 - One arm with SNAT/etc.	N/A	Yes

AD, TACACS, RBAC Scalability Limits

Configurable Options	Per Leaf Scale	Per Fabric Scale
Number of ACS/AD/LDAP authorization domains	N/A	4 (16 maximum /server type)
Number of login domains	N/A	15
Number of security domains/APIC	N/A	15
Number of security domains in which the tenant resides	N/A	4
Number of priorities	N/A	4 (16 per domain)
Number of shell profiles that can be returned.	N/A	4 (32 domains total)
Number of users	N/A	8,000 local / 8,000 remote
Number of simultaneous logins	N/A	500 connections / NGNIX simultaneous REST logins

Cisco Mini ACI Fabric and Virtual APICs Scalability Limits

Property	Maximum Scale
Multicast Groups	200
BGP + OSPF Sessions	25
Number of Graphs Instances	20
Maximum number of L4-L7 logical device clusters	3 Physical or 10 Virtual
Number of Pods	1
GOLF VRF, Route Scale	N/A
Tenants	25
Endpoints	20,000
Bridge domains (BDs)	1,000
Endpoint groups (EPGs)	1,000
VRFs	25
Number of Leafs	4
Number of Spines	2
Contracts	2,000

Cisco Cloud APIC Scalability Limits

This section contains scalability numbers for Cisco ACI cloud deployments. The scalability limits differ based on whether it's a single cloud site or a multi-cloud deployment.

Single Cloud Site

This section contains scalability numbers for a single cloud site deployment. The same scale numbers apply to both, AWS or Azure, cloud providers.

Table 1: Single Cloud Site

Configurable Options	Scale
Number of Tenants	20
Number of Application Profiles	500
Number of EPGs	500

Configurable Options	Scale
Number of cloud Endpoints	1,000
Number of VRFs	20
Cloud Context Profiles	40
Number of Contracts	1,000
Number of L4-L7 Service Graphs	200
Number of L4-L7 Services Devices (AWS ALB)	100

Multi-Cloud Deployments

This section contains scalability numbers for multi-cloud deployments. The same scale numbers apply to each cloud site (AWS or Azure) with intersite connectivity provided by the ACI Multi-Site Orchestrator. Total number of stretched and non-stretched objects must not exceed the maximum verified scalability limit for that object.

Table 2: Multi-Cloud Deployments

Configurable Options	Scale
Number of cloud sites	2
Number of managed regions per site	4
Number of CSRs per site	4
Number of CSRs per region	2
Number of Tenants	5
Number of EPGs	250
Number of cloud endpoints	500
Number of VRFs	10
Cloud Context Profiles (VPC/VNET)	40
Number of Contracts	200

Cisco ACI and UCSM Scalability

The following table shows verified scalability numbers for Cisco Unified Computing System with Cisco ACI `ExternalSwitch` app.

Configurable Options	Scale
Number of UCSMs per APIC cluster	12
Number of VMM Domains per UCSM	4

Configurable Options	Scale
Number of VLANs + PVLAN per UCSM	4,000
Number of vNIC Templates per UCSM	16

QoS Scalability Limits

The following table shows QoS scale limits. The same numbers apply for topologies with or without remote leafs as well as with COS preservation and MPOD policy enabled.

QoS Mode	QoS Scale
Custom QoS Policy with DSCP	7
Custom QoS Policy with DSCP and Dot1P	7
Custom QoS Policy with Dot1P	38
Custom QoS Policy via a Contract	38

PTP Scalability Limits

The following table shows Precision Time Protocol (PTP) scale limits.

Configurable Options	Scale (IEEE 1588 Default Profile)	Scale (AES67, SMPTE-2059-2)
Number of leaf switches connected to a single spine with PTP globally enabled	128	40
Number of ACI switches connected to the same tier-1 leaf switch (multi-tier topology) with PTP globally enabled	16	16
Number of access ports with PTP enabled on a leaf switch	25 **Note** For improved performance on 1G interfaces with N9K-C93108TC-FX3P switches, the maximum number of 1G interfaces should not exceed 10 out of 25	25 **Note** For improved performance on 1G interfaces with N9K-C93108TC-FX3P switches, the maximum number of 1G interfaces should not exceed 10 out of 25
Number of PTP peers per access port	PTP Mode Multicast (Dynamic/Master): 2 peers PTP Mode Unicast Master: 1 peer	PTP Mode Multicast (Dynamic/Master): 2 peers PTP Mode Unicast Master: 1 peer
Number of PTP peers per leaf switch	26	26

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS REFERENCED IN THIS DOCUMENTATION ARE SUBJECT TO CHANGE WITHOUT NOTICE. EXCEPT AS MAY OTHERWISE BE AGREED BY CISCO IN WRITING, ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS DOCUMENTATION ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED.

The Cisco End User License Agreement and any supplemental license terms govern your use of any Cisco software, including this product documentation, and are located at: https://www.cisco.com/c/en/us/about/legal/cloud-and-software/software-terms.html. Cisco product warranty information is available at https://www.cisco.com/c/en/us/products/warranty-listing.html. US Federal Communications Commission Notices are found here https://www.cisco.com/c/en/us/products/us-fcc-notice.html.

IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Any products and features described herein as in development or available at a future date remain in varying stages of development and will be offered on a when-and if-available basis. Any such product or feature roadmaps are subject to change at the sole discretion of Cisco and Cisco will have no liability for delay in the delivery or failure to deliver any products or feature roadmap items that may be set forth in this document.

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

The documentation set for this product strives to use bias-free language. For the purposes of this documentation set, bias-free is defined as language that does not imply discrimination based on age, disability, gender, racial identity, ethnic identity, sexual orientation, socioeconomic status, and intersectionality. Exceptions may be present in the documentation due to language that is hardcoded in the user interfaces of the product software, language used based on RFP documentation, or language that is used by a referenced third-party product.

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: https://www.cisco.com/c/en/us/about/legal/trademarks.html. Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1721R)

© 2020 Cisco Systems, Inc. All rights reserved.

Americas Headquarters
Cisco Systems, Inc.
San Jose, CA 95134-1706
USA

Asia Pacific Headquarters
CiscoSystems(USA)Pte.Ltd.
Singapore

Europe Headquarters
CiscoSystemsInternationalBV
Amsterdam,TheNetherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at www.cisco.com/go/offices.