

Cisco Nexus 9000 Series NX-OS Verified Scalability Guide, Release 9.2(3)
Introduction 2
Verified Scalability Limits - Unidimensional 2
Verified Scalability Limits - Multidimensional 35
Deployment Case Studies 41

## Revised: March 13, 2023

## Introduction

This document describes the Cisco NX-OS configuration limits for Cisco Nexus 9000 Series switches.
The values provided in this guide should not be interpreted as theoretical system limits for Cisco Nexus 9000 Series hardware or Cisco NX-OS software. These limits refer to values that have been validated by Cisco. They can increase over time as more testing and validation is done.

## Verified Scalability Limits - Unidimensional

The tables in this section list the verified scalability limits for the Cisco Nexus 9000 Series switches for Cisco NX-OS Release 9.2(3).
These limits are validated with a unidimensional configuration. The values that are provided in these tables focus on the scalability of one particular feature at a time.

Each number is the absolute maximum that is currently supported that is by this Cisco NX-OS release for the corresponding feature. If the hardware is capable of a higher scale, future software releases might increase this verified maximum limit. Results might differ from the values that are listed in this guide when you try to achieve maximum scalability with multiple features enabled.

Note 1. If only one number is provided, the verified limit applies to all supported platforms and line cards.
2. Verified limits are provided only for supported platforms.
3. If a feature is not supported for a particular platform, the verified limit is not provided.

Table 1: Cisco Nexus 2000 Series Fabric Extenders (FEX) Straight Through Mode Verified Scalability Limits (Unidimensional)

| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| Fabric Extenders <br> server interfaces | and Fabric Extender | Nexus 9300, 9300-EX, and 9300-FX/FX2 <br> switches |
|  | Nexus 9500 switches | and 768 |
| VLANs across all Fabric Extenders | Nexus 9300 and 9500 switches | 2,000 |
|  | Nexus 9300-EX and 9300-FX switches | 562 |
| VLANs per Fabric Extender server <br> interface | Nexus 9300, 9300-EX, 9300-FX, and 9500 <br> switches | 75 |
|  | Nexus 9300 switches | 256 |
|  | Nexus 9300-EX and 9300-FX/FX2 <br> switches + FEX | 511 |
|  | Nexus 9500 switches | 426 |


| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| Unique Fabric Extenders per Cisco Nexus <br> 9500 Series supported line card | Nexus 9500 switches | 12 |

${ }^{1}$ When FEX configured using "AA" mode, then the maximum number of 6 FEX on NFE base ToR and 16 FEX for LSE base ToR are supported.
${ }^{2}$ For FEX HIF port channels, Cisco recommends that you enable the STP port type edge using the spanning tree port type edge [trunk] command.

Table 2: FCoE Verified Scalability Limits (Unidimensional)

| Feature $\mathbf{3}^{\mathbf{3}}$ | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| FLOGI per port | Nexus 93180YC-FX switches | 256 |
| FLOGI per switch | Nexus 93180 YC-FX switches | 1,000 |
| Port channels | Nexus 93180 YC-FX switches | $8^{4}$ |
| Member ports in a port channel | Nexus $93180 Y C-F X$ switches | 16 |
| VFCs | Nexus 93180YC-FX switches | 544 |
| VSANs | Nexus $93180 Y C-F X$ switches | 32 |

${ }^{3}$ Feature Verified Limit is 5.
4 The number of SAN port channels and virtual FC port channels, together, can be only 8 on the Cisco Nexus 9000 Series switch.

Note For a list of platforms on which FCoE is supported, see the Cisco Nexus 9000 Series NX-OS FCoE Configuration Guide.

## Table 3: FC Verified Scalability Limits (Unidimensional)

| Feature $\mathbf{5}^{\mathbf{5}}$ | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| FLOGI per port | Nexus 93180 YC-FX switches | 256 |
| FLOGI per switch | Nexus $93180 Y$ Y-FX switches | 1,000 |
| Port channels | Nexus $93180 Y C-F X$ switches | 86 |
| Member ports in a port channel | Nexus $93180 Y C-F X$ switches | 16 |
| Max number of FC ports supported | Nexus 93180YC-FX switches | 48 |
| VSANs | Nexus $93180 Y C-F X$ switches | 32 |

${ }^{5}$ Feature Verified Limit is 6 .
6 The number of SAN port channels and virtual FC port channels, together, can be only 8 on the Cisco Nexus 9000 Series switch.

Table 4: Intelligent Traffic Director Verified Scalability Limits (Unidimensional)

| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| Nodes per device group | Nexus 9200, 9300, 9300-EX/FX/FX2 and <br> 9500 switches | 32 |
| Nodes across all device groups | Nexus 9200, 9300, 9300-EX/FX/FX2 and <br> 9500 switches | 256 |
| Device groups per switch | Nexus 9200, 9300, 9300-EX/FX/FX2 and <br> 9500 switches | 48 |
| ITD services per switch | Nexus 9200, 9300, 9300-EX/FX/FX2 and <br> 9500 switches | 64 |
| Ingress interfaces per ITD service | Nexus 9200, 9300, 9300-EX/FX/FX2 and <br> 9500 switches | 8 |
| Virtual IP addresses per ITD service | Nexus 9200, 9300, 9300-EX/FX/FX2 and <br> 9500 switches | 255 |
| Device groups per ITD service | Nexus 9200, 9300, 9300-EX/FX/FX2 and <br> 9500 switches | 48 |

Note For a list of platforms on which ITD is supported, see the Cisco Nexus 9000 Series NX-OS Intelligent Traffic Director Configuration Guide.

Table 5: Interfaces Verified Scalability Limits (Unidimensional)

| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| DHCP clients per switch | Nexus 9200, 9300, 9300-EX, <br> 9300-FX/FX2, 9500 switches, and the <br> Nexus 9700-EX line cards | 10 (IPv4) + 10 (IPv6) |
| Flex link | Nexus 9300-EX, 9300-FX/FX2, and 9364C <br> switches | One pair consists of one each of active and <br> backup interface. The active and backup <br> interface can be either a physical port or <br> port channel. |
| IP DHCP relay addresses (helper addresses) <br> per switch | Nexus 9200, 9300, 9300-EX, <br> $9300-F X / F X 2, ~ 9500 ~ s w i t c h e s, ~ a n d ~ t h e ~$ <br> Nexus 9700-EX line cards | 32 (IPv4) + 32 (IPv6) |
| Generic routing encapsulation (GRE) <br> tunnels | Nexus 9200, 9300, 9300-EX, <br> 9300-FX/FX2, 9500 switches, and the <br> Nexus 9700-EX line cards | 8 |
| MAC address - table limit per port | Nexus 9600-RX line cards | 2,000 |


| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| MAC address - table system, VLAN limit | Nexus 9600-RX line cards | 2,000 |
| Port channel links | Nexus 9200, 9300, 9300-EX, <br> $9300-F X / F X 2, ~ 9500 ~ s w i t c h e s, ~ a n d ~ t h e ~$ <br> Nexus 9700-EX line cards | 32 |
| SVIs | Nexus 9200 switches | Nexus 9300 switches |

Table 6: Label Switching Verified Scalability Limits (Unidimensional)

| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| Forwarding Equivalence Classes (FECs) (Node /Prefix /Adj / Binding SID) | Nexus 9200 switches | MPLS Heavy Template: 512; Default: 128 |
|  | Nexus 9300 and 9500 switches | 128 |
|  | Nexus 9300-EX, 9300-FX, 9500 switches, and the Nexus 9700-EX/FX line cards | MPLS Heavy Template: 4096; Default: 1024 |
|  | Nexus 9600-R and 9600-RX line cards | 1,000 |
| Equal-cost multipaths (ECMPs) | Nexus 9200, 9300, and 9500 switches | 16 |
|  | Nexus 9600-R and 9600-RX line cards | 8 -way |
|  | Nexus $9300-E X, 9300-\mathrm{FX}, 9500$ switches, and the Nexus 9700-EX/FX line cards | 32 |
| Equal-cost multipaths (ECMPs) Groups | Nexus $9300-E X, 9300-\mathrm{FX}, 9500$ switches, and the Nexus 9700-EX/FX line cards | MPLS Heavy Template: 4096; Default: 1024 |
|  | Nexus 9600-RX line cards | 24K ECMP Groups 2 paths per ECMP |
| FECs * ECMPs | Nexus 9200, 9300, and 9500 switches | 1,000 |
|  | Nexus 9600-R and 9600-RX line cards | 8,000 |
| Flex counters for segment-routing in ingress direction | Nexus 9300 and 9500 switches | 4,000 (includes ingress and egress) |
|  | Nexus 9200 switches | 4,000 (includes ingress and egress) (MPLS Heavy Template) |
|  | Nexus 9300-EX, 9300-FX switches, and the Nexus 9700-EX/FX line cards | Total ingress label stats: 4000; VRF ingress label stats: 1,000; (MPLS Heavy Template) |
| Flex counters for segment-routing in Egress direction | Nexus 9300 and 9500 switches | 4,000 (includes ingress and egress) |
|  | Nexus 9200 switches | 4000 (includes ingress and egress) <br> (MPLS Heavy Template) |
|  | Nexus $9300-$ EX and $9300-\mathrm{FX}$ switches, and the Nexus 9700-EX/FX line cards | Total ingress label stats: 48 K (MPLS Heavy Template) |
| Egress Peer Engineering | Nexus 9200, $9300,9300-E X, 9300-F X, 9500$ switches, and the Nexus 9700-EX/FX line cards | 64 |
| IAS option B labels | Nexus 9600-R and 9600-RX line cards | 450,000 |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| Label-switched paths (LSPs) for label stack imposition $^{7}$ | Nexus 9300 and 9500 switches | 128 (with 4-way ECMP and 3 label stack push) |
|  | Nexus 9200, 9300-EX, 9300-FX switches, and the Nexus 9700-EX/FX line cards | 256 (with 32-way ECMP and 5 label stack push) |
| Layer 3 VPN routes | Nexus 9600-R and 9600-RX line cards | 450,000 |
| Layer 3 EVPN Labels | Nexus 9300 and 9500 switches | 128 |
|  | Nexus 9200 switches | 128 (With MPLS Heavy Template) |
|  | Nexus 9300-EX, 9300-FX switches, and the Nexus 9700-EX/FX line cards | 1,000 (With MPLS Heavy Template) |
| LDP session | Nexus 9600-RX line cards | 200 |
| Node Sid/Prefix SID | Nexus 9200, 9300, and 9500 switches | 128 |
|  | Nexus 9300-EX, 9300-FX switches, and the Nexus 9700-EX/FX line cards | 4,000 |
| Adjacency SID | Nexus 9200, 9300, and 9500 switches | 128 |
|  | Nexus 9300-EX, 9300-FX switches, and the Nexus 9700-EX/FX line cards | 600 |
| Binding SID | Nexus 9200, 9300, and 9500 switches | 50 |
|  | Nexus 9300-EX, 9300-FX switches, and the Nexus 9700-EX/FX line cards | 1,000 |
| Private VLANs (PVLANs) |  |  |
| Primary VLANs ${ }^{\text {8 }}$ | Nexus 9300, 9300-FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 16 |
|  | Nexus 9300-EX and 9300-FX switches | 400 |
| Secondary VLANs ${ }^{9}$ | Nexus 9300, 9300 -FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 20 |
|  | Nexus 9300-EX and 9300-FX switches | 400 |
| Ports in Community host mode | Nexus 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 40 |
| Ports in isolated host mode | Nexus 9500 switches | 20 |
|  | Nexus 9300, 9300-EX, 9300-FX/FX2 switches, and the Nexus 9700-EX/FX line cards | 40 |


| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| Ports in isolated trunk <br> host mode | Nexus 9500 switches | 22 |
|  | Nexus 9300, Nexus 9300-EX, 9300-FX/FX2 switches, and the <br> Nexus 9700-EX/FX line cards | 40 |
| Ports in promiscuous <br> mode | Nexus 9300-EX and 9300-FX switches | 10 |
|  | Nexus 9500 switches | 48 |
|  | Nexus 9300 and 9300-FX2 switches, and the Nexus 9700-EX/FX <br> line cards | 5 |
| Ports in promiscuous <br> trunk mode | Nexus 9300-EX and 9300-FX switches | 10 |
|  | Nexus 9500 switches | 80 |
|  | Nexus 9300 and 9300-FX2 switches, and the Nexus 9700-EX/FX <br> line cards | 5 |
| PVLANs allowed on a <br> PVLAN port 10 | Nexus 9300-EX and 9300-FX switches | 16 |
|  | Nexus 9300, 9300-FX2, 9500 switches, and the Nexus <br> $9700-E X / F X ~ l i n e ~ c a r d s ~$ | 400 |

${ }^{7}$ For Cisco Nexus 9300 and 9500 Series switches, LSPs *ECMP* label stack push cannot exceed 1500.
8 The 400 PVLAN-mapping scale per PVLAN port is only applicable when port is configured as promiscuous trunk port
${ }^{9}$ The 400 PVLAN-mapping scale per PVLAN port is only applicable when port is configured as promiscuous trunk port
10 The 400 PVLAN mapping scale per PVLAN port is only applicable when port is configured as promiscuous trunk port

Note For network scalability, Cisco recommends using a hierarchical routing design with multi-hop BGP for advertising the attached prefixes from a top-of-rack (ToR) or border leaf switch.

## Table 7: Layer 2 Switching Verified Scalability Limits (Unidimensional)

| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| MAC addresses | Nexus 9200 and 9300-EX switches, and the Nexus 9700-EX/FX line cards | 92,000 |
|  | Nexus 9300-FX/FX2 switches | 74,000 |
|  | Nexus 9300 and 9500 switches | 90,000 |
|  | Nexus 9600-R and 9600-RX line cards | 192,000 |
|  | Nexus 9200 and 9300-EX switches ${ }^{11}$ | 200,000 ${ }^{12}$ |
| MST instances | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9600-R, 9600-RX, and 9700-EX/FX line cards | 64 |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| MST PV count with single instances 0 | Nexus 9200 and 9300-FX/FX2 switches | 190,000 |
| MST virtual ports with more than 1 MST instance | Nexus 9200, 9300, and 9300-EX, and 9300-FX/FX2 switches | 48,000 |
|  | Nexus 9600-R and 9600-RX line cards | 236,000 |
|  | Nexus 9700-EX/FX line cards | 85,000 |
| RPVST virtual ports | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, and 9500 switches | 12,000 |
|  | Nexus 9600-R and 9600-RX line cards | 13,750 |
|  | Nexus 9700-EX/FX line cards | 22,000 |
| VLANs | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9600-R, 9600-RX, and 9700-EX/FX line cards | 3,967 (the remaining 127 <br> VLANs are reserved) |
| VLANs in RPVST mode | Nexus 9200, 9300, 9300-EX, and 9300-FX/FX2 switches | 3,967 |
|  | Nexus 9300 and 9500 switches | 500 |
|  | Nexus 9600-R and 9600-RX line cards | 250 |
|  | Nexus 9700-EX/FX line cards | 3,967 ${ }^{13}$ |
| Total number of VLANs $\times$ ports with switch port isolated (3967 VLANs x 48 ports) | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 190,000 |
| Private VLANs (PVLANs) |  |  |
| Primary VLANs | Nexus 9300, 9300-EX/FX/FX2, 9500 switches and the Nexus 9700-EX line cards | 16 |
| Secondary VLANs | Nexus 9300, 9300-EX/FX/FX2, 9500 switches and the Nexus 9700-EX line cards | 20 |
| Ports in Community host mode | Nexus 9300, 9300-EX/FX/FX2, 9500 switches and the Nexus 9700-EX line cards | 40 |
| Ports in isolated host mode | Nexus 9500 switches | 20 |
|  | Nexus 9300, 9300-EX/FX/FX2 switches and the Nexus 9700-EX line cards | 40 |
| Ports in isolated trunk host mode | Nexus 9500 switches | 22 |
|  | Nexus 9300, 9300-EX/FX/FX2 switches and the Nexus 9700-EX line cards | 40 |


| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| Ports in promiscuous mode | Nexus 9500 switches | 48 |
|  | Nexus 9300, 9300-EX/FX/FX2 switches and the Nexus 9700-EX line <br> cards | 5 |
|  | Nexus 9500 switches | 80 |
|  | Nexus 9300, 9300-EX/FX/FX2 switches and the Nexus 9700-EX line <br> cards | 5 |
| PVLANs allowed on a PVLAN <br> port | Nexus 9300, 9300-EX/FX/FX2, 9500 switches and the Nexus 9700-EX <br> line cards | 16 |

11 Supported on N9K-C9264PQ, N9K-C9272Q, N9K-C9236C, N9K-C92300YC, N9K-C92304QC, N9K-C9232C, N9K-C92300YC, and 9300-EX switches
12 Layer 2 unidimensional scale only. SVI, Layer 3 interface, and VXLAN VLANs are not supported. 200K MAC is enabled only when "system routing template-12-heavy" is configured and the system is reloaded.
13 On EOR, support is for 12000 PV count with 3967 vlans and RPVST with default timers. If 22000 PV count is needed with 3968 vlans and RPVST, recommended hello timer value is 4 or higher. It is also recommended to tune forward delay and max age accordingly.

- The number of supported VLANs per vPC should be within the MST or RPVST virtual port count that is specified in this table, depending on the topology.
- The number of supported STP VLAN port instances, for Fabric Extender host interface ports, should be less than 13,000.

Table 8: Multicast Routing Verified Scalability Limits (Unidimensional)

| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| IPv4 multicast routes | Nexus 9200 switches | 8,000 (Layer 2 + Layer 3) |
| Note <br> The limits are for a combination of IPv4 an IPv6 multicast routes. Layer 2 multicast routes are part of the total 120 K limits. For example, 110,000 IPv4 + 2,000 IPv6 |  | Note Cisco Nexus 9200 switches do not support the system routing template -Ipm - heavy mode for IPv4 multicast routes. Make sure to reset the LPM maximum limit to 0 . |
|  | Nexus 9300 switches | 8,000 (Layer $2+$ Layer 3) |
|  | Nexus 9300-EX switches | 8,000 (Layer $2+$ Layer 3); 32,000 (Layer $2+$ Layer 3 with system routing template - multicast - heavy mode) |
|  | Nexus 9300-FX/FX2 switches | 8,000 (Layer $2+$ Layer 3); 32,000 (Layer $2+$ Layer 3 with system routing template - multicast - heavy mode); 128,000 (with system routing template - multicast - ext - heavy mode) |
|  | Nexus 9500 switches | 8,000 (Layer $2+$ Layer 3) |
|  | Nexus 9600-R and 9600-RX line cards | 32, 000 (Layer 3) |
|  | Nexus 9700-EX line cards | 8,000 (Layer 2 + Layer 3); 32,000 (Layer $2+$ Layer 3 with system routing template -multicast -heavy mode); 8,000 (with system routing template - lpm - heavy mode) |
|  | Nexus 9700-FX line cards | 8,000 (Layer $2+$ Layer 3); 32,000 (Layer $2+$ Layer 3 with system routing template -multicast -heavy mode); 128,000 (with system routing template - multicast - ext - heavy mode ${ }^{14}$ |
| IPv6 multicast routes | Nexus 9300-FX2 and 9364C switches | 8,000 (Layer 3 with system routing template -multicast -heavy mode) |
| Outgoing interfaces (OIFs) | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus $9700-E X / F X$ line cards | 40 (SVI + physical Layer 3) or 256 (physical Layer 3) |
|  | Nexus 9600-R and 9600-RX line cards | 16 OIFs for 32 K mroutes or 287 OIFs for 1000 mroutes |
| IGMP snooping groups | Nexus 9200, 9300, 9300-EX, 9500 switches, and the Nexus $9700-E X$ line cards | 8,000 |
|  | Nexus 9300-FX/FX2 switches and the Nexus 9700-FX line cards | 16,000 |
| PIM neighbors | Nexus 9200, 9300, 9300-EX, and 9300-FX/FX2 switches | 250 |
|  | Nexus 9600-R, 9600-RX, and 9700-EX/FX line cards | 500 |

14 All line cards must have the FX type.

- The IPv4 multicast routes and the IPv4/IPv6 host routes share the same hardware table. Limits are provided for both the default line card mode and the max host line card mode.
- High availability (graceful restart and stateful switchover) is not supported when unicast or multicast aggressive timers are configured at any scale.

Table 9: IP Fabric for Media Solution Verified Scalability Limits (Unidimensional)

| Feature | Verified Limits |
| :--- | :--- |
| Nodes | 29 (2spine and 27 <br> leafs) |
| Routes | 32,000 |
| Host Policy | 8,000 |
| Sender | 8,000 |
| Receiver | 512 |
| PIM | 2,000 |
| FlowPolicy | 20 |
| ASM group-range | 8,000 |
| NBM Static Flows | 1,500 |
| Per switch maximum (receiver leaf where the static OIF will be programmed) mroutes |  |
| Per fabric maximum mroutes | 1 |

Note For a list of supported platforms, see Cisco Nexus 9000 Series NX-OS IP Fabric for Media Solution Guide.

## Table 10: Programmability Verified Scalability Limits (Unidimensional)

| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| OpenFlow ports | Nexus 9300 switches | 96 |
| OpenFlow Layer 2 flows | Nexus 9300 switches | 32,000 |
| OpenFlow Layer 3 flows | Nexus 9300 switches | 3,000 |
| OpenFlow IPv6 Layer 3 flows | Nexus 9300 switches | 1,500 |

Table 11: Security Verified Scalability Limits (Unidimensional)

| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| DHCP snooping bindings | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 2,048 |
| IPv4 ingress access control entries (ACEs) | Nexus 9600-R and 9600-RX line cards | - RACL on LC N9K-X9636C-RX: 100,000 <br> - PACL on LC N9K-X9636C-RX: 12,000 <br> - RACL-2048, PACL-1024 (without TCAM Carving) IPv4 52640 ACEs per system <br> - PACL IPv4: 1024 TCAM entries in internal TCAM <br> - PACL MAC: 2048 TCAM entries in internal TCAM <br> - RACL IPv4: 2048 TCAM entries in internal TCAM |
| IPv6 ingress access control entries (ACEs) | Nexus 9600-R and 9600-RX line cards | - RACL-1024, PACL-1024 (without TCAM Carving) IPv6 25200 ACEs per system <br> - PACL IPv6: 1024 TCAM entries in internal TCAM <br> - RACL IPv6: 1024 TCAM entries in internal TCAM |
| IPv4 ingress TCAM entries | Nexus 9200, 9300-EX, 9300-FX switches, and the Nexus $9600-\mathrm{R}, 9600-\mathrm{RX}$, and the 9700-EX/FX line cards | 3,582 (per slice of the forwarding engine) |
|  | Nexus 9300-FX2 switches | 3,582 |
|  | Nexus 9300 and 9500 switches | 3,072 (per network forwarding engine) |
| IPv4 egress TCAM entries | Nexus 9200, 9300-EX, 9300-FX/FX2 switches, and the Nexus $9700-E X / F X$ line cards | 1,792 (per slice of the forwarding engine) |
|  | Nexus 9300 and 9500 switches | 768 (per network forwarding engine) |
|  | Nexus 9600-R line cards | 20,000 |


| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| IPv6 ingress TCAM entries | Nexus 9200, 9300-EX, 9300-FX/FX2 <br> switches, and the Nexus 9700-EX/FX line <br> cards | 1,792 (per slice of the forwarding engine) |
|  | Nexus 9300 and 9500 switches | 1,536 (per network forwarding engine) |
| IPv6 egress TCAM entries | Nexus 9200, 9300-EX, 9300-FX/FX2 <br> switches, and the Nexus 9600-R, 9600-RX, <br> 9700-EX/FX line cards | 896 (per slice of the forwarding engine) |
|  | Nexus 9300 and 9500 switches | 256 (per network forwarding engine) |
| System ACLs | Nexus 9600-R line cards | 4000 TCAM entries in internal TCAM |

Note The TCAM entries scalability limits also apply to policy-based TCAM entries (PBACLs).

## Table 12: System Management Verified Scalability Limits (Unidimensional)

| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| MPLS Stripping |  |  |
| Labels | Nexus 9300 and 9500 switches | 12,000 |
| Ingress interfaces | Nexus 9200 and 9300 switches | 48 |
|  | Nexus 9500 switches | 400 |
| Egress interfaces | Nexus 9200 and 9300 switches | 16 |
|  | Nexus 9500 switches | 64 |
| PTP |  |  |
| PTP ports | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, and 9500 switches | 64 |
|  | Nexus 9200 switches ${ }^{15}$ | 44 |
|  | Nexus 9600-R, 9600-RX, and 9700-EX/FX line cards | 1305 |
|  | Nexus 9508-R line cards | 64 <br> Note PTP Offload is supported on 9508-R line cards. |
| sFlow |  |  |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| sFlow ports | Nexus 9200, 9300, 9300-EX, and 9300-FX/FX2 switches | 64 |
|  | Nexus 9500 switches and the Nexus 9700-EX/FX line cards | 256 |
| SPAN and ERSPAN |  |  |
| Configurable SPAN or ERSPAN sessions | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9600-R, 9600-RX, 9700-EX/FX line cards | 32 |
| Active SPAN or ERSPAN sessions ${ }^{16}$ | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2 and 9500 switches | 4 |
|  | Nexus 9700-EX/FX line cards | 4 to 32 , based on the number of line cards and the session configuration |
|  | Nexus 9600-R and 9600-RX line cards | 32 |
| Active localized SPAN or ERSPAN sessions per line card ${ }^{17}$ | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9600-R, 9600-RX, 9700-EX/FX line cards | 4 |
|  | Nexus 9600-R and 9600-RX line cards | 32 sessions across ports on single line card |
| Active localized SPAN or ERSPAN session ( Rx and $\mathrm{Tx}, \mathrm{Rx}$, or $T \mathrm{x}$ ) | Nexus 9600-R and 9600-RX line cards | 32 sessions, 128 sources, and 1 destination |
| Source interfaces per SPAN or ERSPAN session ( $R x$ and $T x, R x$, or $T x$ ) | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9600-R and 9600-RX line cards | 48 |
| Destination interfaces per SPAN session | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9600-R, 9600-RX, and 9700-EX/FX line cards | 1 (physical/PO interface) |
| Source VLANs per SPAN or ERSPAN session | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9600-R, 9600-RX, and 9700-EX/FX line cards | 32 |
| Tap Aggregation |  |  |
| Redirect interfaces in the redirect port list | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, and 9500 switches | 12 |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| Redirect port lists (or fan outs) per system | Nexus 9200, 9300-EX, and 9300-FX/FX2 switches | 12 |
|  | Nexus 9300 and 9500 switches | 100 |
| NetFlow |  |  |
| Flow monitors | Nexus 9300-EX switches | 2 exporters and 2 flow monitors per type (2 IPv4 flow monitors and 2 IPv6 flow monitors) |
|  | Nexus 9300-FX/FX2 switches | 2 exporters and 32 flow monitors per type (32 Layer 2 flow monitors, 32 IPv4 flow monitors, and 32 IPv6 flow monitors) |
| Number of Layer 3 interfaces (Layer 3 ports, port channels, and SVIs) to which IPv4 flow monitors can be applied | Nexus 9300-EX switches | Number of Layer 3 interfaces (Layer 3 ports, port channels, and SVIs) to which IPv4 flow monitors can be applied. You can use the show interface hardware-mappings command to check if the interface belongs to ASIC slice 0 or slice 1 . |
| Number of Layer 3 interfaces (Layer 3 ports, port channels, and SVIs) to which IPv6 flow monitors can be applied | Nexus 9300-EX switches | 252 (with members on just one ASIC slice) or 126 (with members on both ASIC slices). You can use the show interface hardware-mappings command to check if the interface belongs to ASIC slice 0 or slice 1 . |

15 N9K-C92160YC-X
16 A single forwarding engine instance supports four SPAN or ERSPAN sessions. For Cisco Nexus 9300 Series switches, if the first three sessions have bidirectional sources, the fourth session has hardware resources only for Rx sources. This limitation might also apply to Cisco Nexus 9500 Series switches, depending on the SPAN or ERSPAN source's forwarding engine instance mappings.
17 The number of SPAN or ERSPAN sessions per line card reduces to two if the same interface is configured as the bidirectional source in more than one session.


PTP is supported for all Cisco Nexus 9000 Series hardware except for the 100G 9408PC line card and the 100G M4PC generic expansion module (GEM).

Table 13: Unicast Routing Verified Scalability Limits (Unidimensional)

| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| Unicast Routing |  |  |


| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| BFD sessions (echo mode) | Nexus 9200, 9300, 9364C, 9300-EX, and <br> 9300-FX/FX2 switches | 128 <br> Note <br> Cisco Nexus 9300 (EX, FX, <br> FX2, and 9364C) platform <br> switches support up to 512 <br> BFD sessions, when the BFD <br> intervals are relaxed to 300 <br> ms. |
|  |  | Nexus 9500 switches |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| IPv4 ARP | Nexus 9200 and 9364C switches | 32,000 |
|  | Nexus 9300, 9500 switches, and Nexus 9600-R and 9600-RX line cards | 48,000 |
|  | Nexus 9300-EX and 9300-FX switches | 48,000 / 32,000 (with out/with urpf enabled) (in default routing mode, Hash Table: Shared between IPv6 ND, IPv4 ARP) |
|  | Nexus 9300-FX2 switches | 64,000 / 32,000 (with out/with urpf enabled) (in default routing mode, Hash Table: Shared between IPv6 ND, IPv4 ARP) |
|  | Nexus 9700-EX/FX line cards | 48,000 (default); 32,000 (LPM heavy) |
| IPv4 host routes ${ }^{20}$ | Nexus 9200 switches | 96,000 (hash table and there will be more collisions after 80\%) |
|  | Nexus 9300 and 9500 switches | Default System Routing Mode: 208,000 (hash table and there will be more collisions after 80\%) <br> ALPM Routing Mode: 128,000 with host routes programmed in the LPM table |
|  | Nexus 9364C switches | 96,000 |
|  | Nexus 9300-EX switches | 458,000 (default); 786,000/720,000 (with system routing template -lpm - heavy mode) |
|  | Nexus 9300-FX switches | 471,000 / 419,000 (with out/with urpf enabled) (default); 786,000 / 734,000 (with system routing template -lpm - heavy mode) |
|  | Nexus 9300-FX2 switches | 471,000 (default); 786,000 / 734,000 (with out/with urpf enabled) (with system routing template - lpm - heavy mode) |
|  | Nexus 9600-R line cards | 750,000 |
|  | Nexus 9600-RX line cards | 1,000,000 |
|  | Nexus 9700-EX/FX line cards | 589,000 (default); 786,000 (with system routing template -lpm -heavy mode) |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| IPv6 host routes ${ }^{21}$ | Nexus 9200 switches | 48,000 (hash table and there will be more collisions after 80\%) |
|  | Nexus 9300 and 9500 switches | Default System Routing Mode: 104,000 (hash table and there will be more collisions after 80\%) <br> ALPM Routing Mode: 16000 with host routes programmed in the LPM table |
|  | Nexus 9364C switches | 48,000 |
|  | Nexus 9300-EX switches | 24000 / 16,000 (with out/with urpf enabled) |
|  | Nexus 9300-FX switches | 265,000 / 235,000 (with out/with urpf enabled) (default) 442,000 / 412,000 (with out/with urpf enabled) (with system routing template - lpm - heavy mode) |
|  | Nexus 9300-FX2 switches | 265,000 (default) 442,000 / 412,000 (with out/with urpf enabled) (with system routing template - lpm - heavy mode) |
|  | Nexus 9600-R line cards | 62,000 |
|  | Nexus 9600-RX line cards | 256,000 |
|  | Nexus 9700-EX/FX line cards | 32,000 (FM-E), 235000 (FM-E2) |
| IPv6 ND | Nexus 9200, 9364C, 9300-EX, and 9300-FX2 switches | 32,000 (default), 16,000 (lpm heavy) |
|  | Nexus 9300 and 9500 switches | 48,000 |
|  | Nexus 9300-FX switches | 32,000 (in default routing mode, Hash Table: Shared between IPv6 ND, IPv4 ARP) <br> 16,000 (with system routing template -lpm - heavy mode, Hash Table: Shared between IPv6 ND, IPv4 ARP |
|  | Nexus 9600-R, 9600-RX, and 9700-EX/FX line cards | 32,000 |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| IPv4 unicast routes (LPM)* | Nexus 9200 switches | - Default values: 6000 (IPv4), 1900 (IPv6), and 2000 (multicast) <br> - With hardware profile multicast max-limit lpm-entries 0 configured: 8000 (IPv4), 1900 (IPv6), and 0 (multicast) <br> - With hardware profile ipv6 lpm -entries maximum 0 configured: 14,000 (IPv4), 0 (IPv6), and 2000 (multicast) <br> - With hardware profile ipv6 lpm-entries maximum 4096 and hardware profile multicast max - limit lpm - entries 0 configured: 0 (IPv4), 4096 (IPv6), and 0 (multicast) <br> - When you allocate the entire table for IPv4 or IPv6 LPM unicast routes, the other address family cannot be used |
|  | Nexus 9300 switches | 12,000 (default system routing mode); <br> 128,000 (ALPM routing mode) |
|  | Nexus 9364C switches | - Default values: 8000 (IPv4), 1900 (IPv6), and 2000 (multicast) <br> - With hardware profile multicast max-limit lpm-entries 0 configured: 10000 (IPv4), 1900 (IPv6), and 0 (multicast) <br> - With hardware profile ipv6 lpm-entries maximum 0 configured: 14,000 (IPv4), 0 (IPv6), and 2000 (multicast) <br> - With hardware profile ipv6 lpm-entries maximum 4096 and hardware profile multicast max - limit lpm - entries 0 configured: 4000 (IPv4), 4096 (IPv6), and 0 (multicast) <br> - When you allocate the entire table for IPv4 or IPv6 LPM unicast routes, the other address family cannot be used. |
|  | Nexus 9300-EX switches | 458,000 (default) |
|  | Nexus 9300-FX switches |  |


| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
|  |  | $471,000 / 419,000$ (with out / with urpf <br> enabled) (default) |
|  | Nexus 9300-FX2 switches | 471,000 (default) |
|  | Nexus 9500 switches | 128,000 (default system routing mode) <br> 16,000 (max-host routing mode) 128,000 <br> with no IPv6 routes (64-bit ALPM routing <br> mode) |
|  |  | 192,000 |
|  | Nexus 9600-RX line cards | $1,000,000$ |
|  | Nexus 9700-EX/FX line cards | 589,000 |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| IPv6 unicast routes (LPM)* | Nexus 9200 switches | - Default values: 6000 (IPv4), 1900 (IPv6), and 2000 (multicast) <br> - With hardware profile multicast max-limit lpm-entries 0 configured: 8000 (IPv4), 1900 (IPv6), and 0 (multicast) <br> - With hardware profile ipv6 lpm-entries maximum 0 configured: 14,000 (IPv4), 0 (IPv6), and 2000 (multicast) <br> - With hardware profile ipv6 lpm-entries maximum 4096 and hardware profile multicast max - limit lpm - entries 0 configured: $0(\operatorname{IPv} 4)$, 4096 (IPv6), and 0 (multicast) <br> - When you allocate the entire table for IPv4 or IPv6 LPM unicast routes, the other address family cannot be used. |
|  | Nexus 9300 switches | $7000(6000$ routes $</ 64,1000$ routes $>/ 64)$ (default system routing mode); 20,000 <br> (ALPM routing mode) |
|  | Nexus 9364C switches | - Default values: 8000 (IPv4), 1900 (IPv6), and 2000 (multicast) <br> - With hardware profile multicast max-limit lpm-entries 0 configured: 10000 (IPv4), 1900 (IPv6), and 0 (multicast) <br> - With hardware profile ipv6 lpm-entries maximum 0 configured: 14,000 (IPv4), 0 (IPv6), and 2000 (multicast) <br> - With hardware profile ipv6 lpm-entries maximum 4096 and hardware profile multicast max - limit lpm - entries 0 configured: 4000 (IPv4), 4096 (IPv6), and 0 (multicast) <br> - When you allocate the entire table for IPv4 or IPv6 LPM unicast routes, the other address family cannot be used |
|  | Nexus 9300-EX switches | 206,000 (/64 prefix length); 1900 (non /64 prefix length) |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
|  | Nexus 9300-FX switches | 265,000 / 235,000 (with out/with urpf enabled) (default) |
|  | Nexus 9300-FX2 switches | 265,000 (default) |
|  | Nexus 9500 switches | 20,000 (default system routing mode) 4000 (max-host routing mode) 80,000 with no IPv4 routes (64-bit ALPM routing mode) |
|  | Nexus 9600-RX line cards | 256,000 |
|  | Nexus 9700-EX/FX line cards | 176,000 (/64 prefix length); 3900 (non /64 prefix length) ( FM-E ) and 235,000 ( any prefix len) (FM-E2) |
| IPv4 and IPv6 unicast routes (LPM) in 64-bit ALPM routing mode | Nexus 9500 switches | 128,000 (IPv4) and 80,000 (IPv6) |
| IPv 4 host routes (LPM heavy mode) | Nexus 9236C, 9272Q, 92304QC, and 9364C switches | 262,000 |
|  | Nexus 92160YC-X switches | 650,000 |
|  | Nexus 9300-EX switches | 786,000 / 720,000 (without / with urpf enabled) |
|  | Nexus 9300-FX switches | 786000 / 734000 (without / with urpf enabled) |
|  | Nexus 9300-FX2 switches | 786,000 / 734,000 (without / with urpf enabled) |
|  | Nexus 9700-EX/FX line cards | 786,000 |
| IPv6 host routes (LPM heavy mode) | Nexus 9200 switches | 16,000 |
|  | Nexus 9364C switches | 131,000 |
|  | Nexus 9300-EX switches | 24000 / 16,000 (without / with urpf enabled) (protocol learned host) |
|  | Nexus 9300-FX/FX2 switches | 442,000 / 412,000 (without / with urpf enabled) (protocol learned host) |
|  | Nexus 9700-EX/FX line cards | 32,000 (shared between IPv6 ND and protocol learned host) ( FM-E ) and 235,000 ( FM-E2) |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| IPv4 LPM routes (LPM heavy mode) | Nexus 9236C, 9272Q, and 92304QC switches | 262,000 |
|  | Nexus 92160YC-X switches | 650,000 |
|  | Nexus 9364C switches | 262,000 |
|  | Nexus 9300-EX switches | 786,000 / 720,000 (without / with urpf enabled) |
|  | Nexus 9300-FX switches | 786,000 / 734,000 (without / with urpf enabled) |
|  | Nexus 9300-FX2 switches | 786,000 / 734,000 (with out/with urpf enabled) |
|  | Nexus 9700-EX/FX line cards | 786,000 |
| IPv6 LPM routes (LPM heavy mode) | Nexus 9236C, 9272Q, and 92304QC switches | 131,000 (/64 prefix length); 1900 (non /64 LPM scale) |
|  | Nexus 92160YC-X switches | 294,000 (/64 prefix length); 1900 (non /64 LPM scale) |
|  | Nexus 9364C switches | 131,000 |
|  | Nexus 9300-EX switches | 353,000 / 324,000 (without / with urpf enabled) (/64 prefix length); 1900 (non /64 prefix length) |
|  | Nexus 9300-FX/FX2 switches | 442,000 / 412,000 (without / with urpf enabled) |
|  | Nexus 9700-EX/FX line cards | 235,000 (/64 prefix length); 3900 (non /64 prefix length) (FM-E) and 235,000 (any prefix len) (FM-E2) |
| IPv4 host routes (dual-host mode) | Nexus 9200 and 9364C switches | 163,000 |
|  | Nexus 9300-EX and 9300-FX/FX2 switches | 262,000 |
| IPv6 host routes (dual-host mode) | Nexus 9200 and 9364C switches | 81,000 |
|  | Nexus 9300-EX and 9300-FX/FX2 switches | 131,000 |
| IPv4 LPM routes (dual-host mode) | Nexus 9200 and 9300-EX switches | 6000 |
|  | Nexus 9364C switches | 8,000 |
|  | Nexus 9300-FX/FX2 switches | 7,000 |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| IPv6 LPM routes (dual-host mode) | Nexus 9200, 9300, 9364C, 9300-EX, and 9300-FX/FX2 switches | 1,900 |
| IPv4 ARP (dual-host mode) | Nexus 9200, 9300, 9364C, 9300-EX, and 9300-FX/FX2 switches | 64,000 |
| IPv6 ND (dual-host mode) | Nexus 9200, 9300, 9364C, 9300-EX, and 9300-FX/FX2 switches | 64,000 |
| IPv4 host routes (internet peering mode) | Nexus 9300-EX and 9300-FX/FX2 switches | 1 Million (protocol learned host) |
| IPv6 host routes (internet peering mode) | Nexus 9300-EX, 9500 switches, and Nexus 9700-EX/FX line cards | 16,000 (Hash Table: Shared between IPv6 ND, IPv4 ARP, and protocol learned IPv6 host) |
|  | Nexus 9300-FX/FX2 switches | 5000,000 |
| IPv4 LPM routes (internet peering mode) | Nexus 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus $9700-E X / F X$ line cards | 1 Million |
| IPv6 LPM routes (internet peering mode) | Nexus 9300-EX switches | 500,000 (Prefix length 0-83) 1900 (Prefix length /84-127) |
|  | Nexus 9300-FX/FX2 switches | 500,000 |
|  | Nexus 9700-EX/FX line cards | 176,947 (Prefix 0-47) 500,000 (Prefix length 48-83) 1900 (Prefix length /84-127) |
| IPv4 ARP (internet peering mode) | Nexus 9300-EX and 9500 switches, and the Nexus 9700-EX/FX line cards | 32,000 (Hash Table: Shared between IPv6 ND, IPv4 ARP, and protocol learned IPv6 host) |
|  | Nexus 9300-FX/FX2 switches | 32,000 (Hash Table: Shared between IPv6 ND and IPv4 ARP) |
| IPv6 ND (internet peering mode) | Nexus 9300-EX and 9500 switches, and the Nexus 9700-EX/FX line cards | 16,000 (Hash Table: Shared between IPv6 ND, IPv4 ARP, and protocol learned IPv6 host) |
|  | Nexus 9300-FX/FX2 switches | 16,000 (Hash Table: Shared between IPv6 ND and IPv4 ARP) |
| IS-ISv4 adjacencies (either L1, L2, or sum of L1 and L2 with default timers) | Nexus 9200, 9300, 9364C, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 255 |
| IS-ISv4 BFD sessions (with default timers) | Nexus 9300, 9364C, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9600-R, 9600-RX, and 9700-EX/FX line cards | 255 |


| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| IS-ISv4 routes | Nexus 9200, 9300, 9364C, 9300-EX, <br> 9300-FX/FX2, 9500 switches, and the <br> Nexus 9700-EX/FX line cards | 10,000 |
| IS-ISv4 network type | Nexus 9200, 9300, 9364C, 9300-EX, <br> 9300-FX/FX2, 9500 switches, and the <br> Nexus 9700-EX/FX line cards | Point to point, broadcast |
| Groups with default timers (3s/10s) and <br> multiple group optimizations [There are 2 <br> primary, one for IPv4 and the other for <br> IPv6, and 7926 secondary] | Nexus 9600-R and 9600-RX line cards | 7,928 |
| Groups with aggressive timers (1s/3s) and <br> multiple groups optimization. [There are 2 <br> primary, one for IPv4 and the other for <br> IPv6, and 7926 secondary] | Nexus 9600-R and 9600-RX line cards | 7,928 |
| Groups per interface or I/) module | Nexus 9600-R, 9600-RX, and 9700-EX/FX <br> line cards | Maximum 16 (Because 16 is the unique <br> virtual MAC address limit) |
| Policy-based routing (PBR) | Nexus 9600-R, 9600-RX, and 9700-EX/FX <br> line cards | 1,000 |
| OSPFv2 neighbors | Nexus 9200, 9300, 9364C, 9300-EX, and <br> 9300-FX/FX2 switches | 256 |
| VRFs | Nexus 9200, 9300, 9364C, 9300-EX, <br> $9300-F X, ~ 9300-F X 2, ~ 9500 ~ s w i t c h e s, ~ a n d ~$ |  |
| the Nexus 9700-EX/FX line cards |  |  |$\quad 1,000$


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| Configured sequences per policy | Nexus 9200, 9300-EX, 9300-FX/FX2 switches, and the Nexus $9700-E X / F X$ line cards | 128 |
|  | Nexus 9300 and 9500 switches | 256 |
| Next-hop addresses per policy | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9600-R, 9600-RX, and 9700-EX/FX line cards | 32 |
| IPv4 ACEs (unidimensional) | Nexus 9200, 9300-EX, 9300-FX/FX2 switches, and the Nexus 9600-R, 9600-RX, and 9700-EX/FX line cards | 3582 (per network forwarding engine) |
|  | Nexus 9300 and 9500 switches | 3072 (per network forwarding engine) |
| IPv6 ACEs (unidimensional) | Nexus 9200, 9300-EX, and 9300-FX/FX2 switches | 1792 (per network forwarding engine) |
|  | Nexus 9300 and 9500 switches | 1536 (per network forwarding engine) |
| IPv4 and IPv6 ACEs | Nexus 9200, 9300-EX, and 9300-FX/FX2 switches | $1024 \mathrm{IPv} 4+128$ IPv6 |
|  | Nexus 9300 and 9500 switches | 2048 IPv4 + 256 IPv6 |
|  | Nexus 9700-EX/FX line cards | 1024 IPv4, IPv6 is not applicable |
| Interfaces with PBR policy | Nexus 9200, 9300-EX, 9300-FX/FX2 switches, and the Nexus $9700-E X / F X$ line cards | 512 |
|  | Nexus 9300 and 9500 switches | 256 |
| VRRPv3 |  |  |
| VRRPv3 groups per interface | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 255 |
| VRRPv3 groups with default timers (1 s) | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 490 |
| VRRPv3 groups with relaxed timers (3 s) | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 490 |
| Pathways with one VRRPv3 group with default timer ( 1 s ) | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 489 |


| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| VRRPv3 groups and pathways combined | Nexus 9200, 9300, 9300-EX, <br> 9300-FX/FX2, 9500 switches, and the <br> Nexus 9600-R, 9600-RX, and 9700-EX/FX <br> line cards | 490 |

18 The limit of supported BFD sessions for each EoR line card is 75.
19 If you have more than 490 groups, then only one group per SVI. SVIs cannot have a user defined MAC or any VRRP group with it.
The hash table is subject to collisions. Depending on the host route pattern, collisions might occur.
21 The hash table is subject to collisions. Depending on the host route pattern, collisions might occur.
22 If the user has Multi-protocol configuration, user should configure appropriate CoPP policies so as to avoid any control plane traffic drops.
For the Cisco Nexus 9200 Platform switches, the default value for LPM unicast routes is 6000 (IPv4) or 1900 (IPv6). You can use the hardware profile multicast max-limit lpm-entries $\mathbf{0}$ command to increase the number of IPv4 LPM unicast routes to 8000 . The hardware profile ipv6 lpm-entries maximum 0 command reserves the entire LPM table for IPv4. With this configuration, the IPv4 LPM scale is 14,000 (with 2000 reserved for multicast by default). This value can be increased to 16,000 with the hardware profile multicast max-limit lpm-entries 0 command. The hardware profile ipv6 lpm-entries maximum 4096 command reserves the entire LPM table for IPv6. With this configuration, the IPv6 LPM scale is 3900 . When you allocate the entire table for $\operatorname{IPv} 4$ or IPv6 LPM unicast routes, the other address family cannot be used.

The maximum number of PBR next-hops based on 4 FM-E supported is 192 per slice of the forwarding engine


- The IPv4/IPv6 host routes and the IPv4 multicast routes share the same hardware table. Limits are provided for both the default line card mode and the max host line card mode.
- The IPv4 and IPv6 unicast routes share the same hardware table. Limits are provided for both the default line card mode and the max host line card mode.
- High availability (graceful restart and stateful switchover) is not supported when unicast or multicast aggressive timers are configured at any scale.

Guidelines and Limitations for OSPF Verified Scalability Limits

- To achieve the highest scale, we recommend that you use a single OSPF instance instead of multiple instances.
- Each OSPFv2 and OSPFv3 scale value might vary when combined with other parameters.
- The graceful restart timeout value might need to be increased in multi-dimensional scenarios.

Table 14: PVLAN VXLAN Verified Scalability Limits (Unidimensional)

| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| Primary VLANs | Nexus 9300-EX and 9300-FX/FX2 <br> switches | 16 |
| Secondary VLANs | Nexus 9300-EX and 9300-FX/FX2 <br> switches | 20 |


| Feature | Supported Platforms | Verified Limits |
| :--- | :--- | :--- |
| Ports in community host mode | Nexus 9300-EX and 9300-FX/FX2 <br> switches | 40 |
| Port in Isolated host mode | Nexus 9300-EX and 9300-FX/FX2 <br> switches | 40 |
| Ports in isolated trunk mode | Nexus 9300-EX and 9300-FX/FX2 <br> switches | 40 |
| Ports in promiscuous mode | Nexus 9300-EX and 9300-FX/FX2 <br> switches | 5 |
| PVLANs allowed on a PVLAN port | Nexus 9300-EX and 9300-FX/FX2 <br> switches | 16 |

Table 15: VXLAN Verified Scalability Limits (Unidimensional)

| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| IGMP snooping over VXLAN |  |  |
| VXLAN VLANs | Nexus 9200, 9300, 9300-EX, $9300-\mathrm{FX} / \mathrm{FX} 2,9500$ switches, and the Nexus 9700-EX/FX line cards | 1000 |
| VTEP Peers ${ }^{23}$ | Nexus 9200 and 9300 switches | 256 |
|  | Nexus 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9600-R, 9600-RX, and 9700-EX/FX line cards | 512 |
| Underlay multicast groups | Nexus 9200, 9300, 9300-EX, <br> $9300-\mathrm{FX} / \mathrm{FX} 2,9500$ switches, and the <br> Nexus 9700-EX/FX line cards | 128 |
| VXLAN Flood and Learn |  |  |
| Virtual network identifiers (VNIs) or VXLAN-mapped VLANs | Nexus 9200, 9300, 9300-EX, and 9300-FX/FX2 switches | 2000 |
|  | Nexus 9500 switches and the Nexus 9700-EX/FX line cards | 1000 |
| Underlay multicast groups | Nexus 9200, 9300, 9300-EX, $9300-\mathrm{FX} / \mathrm{FX} 2,9500$ switches, and the Nexus 9700-EX/FX line cards | 128 |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| Overlay MAC addresses | Nexus 9200, 9300, and 9500 switches | 64,000 |
|  | Nexus 9300-EX and 9300-FX switches, and the Nexus 9700-EX/FX line cards | 90,000 |
|  | Nexus 9300-FX2 switches | 60,000 |
| Remote VXLAN tunnel endpoints (VTEPs Multicast) | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 256 |
| Ingress replication peers ${ }^{\underline{24}}$ | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 256 |
| Ingress replication Layer 2 VNIs | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and Nexus 9700-EX/FX line cards | 1000 |
| MAC addresses for ingress replication | Nexus 9200, 9300, and 9500 switches | 64,000 |
|  | Nexus 9300-EX, 9300-FX/FX2 switches, and the Nexus 9700-EX/FX line cards | 90,000 |
| Port VLAN translations under an interface | Nexus 9300 and 9500 switches, and the Nexus 9700-EX/FX line cards | 100 |
|  | Nexus 9300-EX and 9300-FX/FX2 switches | 4,000 |
| Port VLAN translations in a switch | Nexus 9300 switches and the Nexus 9700-EX/FX line cards | 2000 |
|  | Nexus 9300-EX and 9300-FX/FX2 switches | 24000 |
|  | Nexus 9500 switches | 200 |
| Static MAC addresses pointing to a remote VTEP | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 1000 |
| VXLAN VLAN logical port VP count | Nexus 9300 and 9500 switches | 7,000 |
| VXLAN VLANs per FEX port (host interface) | Nexus 9300 and 9500 switches | 75 |
|  | Nexus 93180YC-EX switches | $75^{25}$ |
| Layer 2 routed VNIs for vPC-centralized gateway | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 450 |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| IGMP groups | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 8,192 |
| VXLAN BGP eVPN |  |  |
| Layer 2 VNIs | Nexus 9200, 9300, 9500 switches, and the Nexus 9600-R and 9600-RX line cards | 2000 |
|  | Nexus 9300-EX and 9300-FX/FX2 switches | 2000, 4000 (with no Layer 3 VNIs) |
|  | Nexus 9500 switches and the Nexus 9700-EX/FX line cards | 1000 |
| Xconnect VLANs | Nexus 9300, 9332C, 9364C, 9300-EX, and 9300-FX/FX2 switches | 40 |
| SVI with Distributed Anycast Gateway; Layer 2 VNI extended | Nexus 9200 and 9300-EX switches | $2,000^{26}$ |
|  | Nexus 9300 and 9300-FX/FX2 switches | 2000 |
|  | Nexus 9700-EX/FX line cards | 1000 |
| Layer 3 VNIs / VRFs ${ }^{27}$ | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2 switches, and the Nexus 9600-R and 9600-RX line cards | 900 |
|  | Nexus 9700-EX/FX line cards | 750 |
| Underlay multicast groups | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 128 |
| VTEPs | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9600-R, 9600-RX, and 9700-EX/FX line cards | 512 |
| MAC addresses | Nexus 9200, 9300, and 9500 switches | 64,000 |
|  | Nexus 9300-EX, 9300-FX/FX2, switches, and the Nexus $9600-\mathrm{R}, 9600-\mathrm{RX}$, and 9700-EX/FX line cards | 90,000 |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| IPv 4 host routes | Nexus 9200, 9300, and 9500 switches | 60,000 |
|  | Nexus 9300-EX switches | 458,000 |
|  | Nexus 9300-FX/FX2 switches | 471,000 |
|  | Nexus 9600-R and 9600-RX line cards | 128,000 |
|  | Nexus 9700-EX/FX line cards | 656,000 |
| IPv6 host routes | Nexus 9200, 9300, and 9500 switches | 7,000 |
|  | Nexus 9300-EX switches | 24,000 |
|  | Nexus 9300-FX/FX2 switches | 265,000 |
|  | Nexus 9600-R and 9600-RX line cards | 32,000 |
|  | Nexus 9700-EX/FX line cards | 34,000 |
| Overlay IPv4 LPM routes | Nexus 9200 switches | 8,000 |
|  | Nexus 9300 and 9500 switches | 12,000 |
|  | Nexus 9300-EX switches | 458,000 |
|  | Nexus 9300-FX/FX2 switches | 471,000 |
|  | Nexus 9700-EX/FX line cards | 656,000 |
| Overlay IPv6 LPM routes | Nexus 9200 switches | 2,000 |
|  | Nexus 9300 and 9500 switches | 7000 |
|  | Nexus 9300-EX switches | $206,000^{28}$ |
|  | Nexus 9300-FX/FX2 switches | $265,000^{29}$ |
|  | Nexus 9700-EX/FX line cards | $174,000^{\frac{30}{}}$ |
| VXLAN VLAN logical port VP count | Nexus 9300 switches | 10,000 |
|  | Nexus 9500 switches | 7,000 |
| VXLAN VLANs per FEX port (host interface) | Nexus 9300 and 9500 switches | 75 |
| IGMP groups | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and Nexus 9700-EX/FX line cards | 8,192 |
| VXLAN BGP eVPN Ingress Replication |  |  |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| Layer 2 VNIs | Nexus 9200, 9300, 9300-EX, and 9300-FX/FX2 switches | 2,000 |
|  | Nexus 9500 switches and the Nexus 9700-EX/FX line cards | 1,000 |
| Xconnect VLANs | Nexus 9300, 9300-EX, and 9300-FX/FX2 switches | 40 |
| Selective Qinvni with multiprovider tag | Nexus 93180YC-EX, 93180YC-FX, and 9336C-FX2 switches | 4,000 mappings, 10 provider VLANs; System wide: 48,000 mappings, 512 Provider VLANs |
| SVI with Distributed Anycast Gateway; Layer 2 VNI extended | Nexus 9200 and 9300-EX switches | $2,000^{31}$ |
|  | Nexus 9300 and 9300-FX/FX2 switches | 2,000 |
|  | Nexus 9500 switches and the Nexus 9600-R, $9600-\mathrm{RX}$, and 9700-EX/FX line cards | 1,000 |
| Layer 3 VNIs / VRFs ${ }^{\text {32 }}$ | Nexus 9200, 9300, 9300-EX, and 9300-FX/FX2 switches | 900 |
|  | Nexus 9500 switches and the Nexus 9700-EX/FX line cards | 750 |
| VTEPs | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9600-R, 9600-RX, and 9700-EX/FX line cards | 256 |
| MAC addresses | Nexus 9200, 9300, and 9500 switches | 64,000 |
|  | Nexus 9300-EX, 9300-FX/FX2 switches, and the Nexus $9700-E X / F X$ line cards | 90,000 |
| IPv4 host routes | Nexus 9200, 9300, and 9500 switches | 32,000 |
|  | Nexus 9300-EX switches | 458,000 |
|  | Nexus 9300-FX/FX2 switches | 471,000 |
|  | Nexus 9700-EX/FX line cards | 656,000 |
| IPv6 host routes | Nexus 9200, 9300, and 9500 switches | 7,000 |
|  | Nexus 9300-FX/FX2 switches | 265,000 |
|  | Nexus 9700-EX/FX line cards | 34,000 |


| Feature | Supported Platforms | Verified Limits |
| :---: | :---: | :---: |
| Overlay IPv4 LPM routes | Nexus 9200 switches | 8,000 |
|  | Nexus 9300 and 9500 switches | 12,000 |
|  | Nexus 9300-EX switches | 458,000 |
|  | Nexus 9300-FX/FX2 switches | 471,500 |
|  | Nexus 9700-EX/FX line cards | 656,000 |
| Overlay IPv6 LPM routes | Nexus 9200 switches | 2,000 |
|  | Nexus 9300 and 9500 switches | 7,000 |
|  | Nexus 9300-EX switches | $206,000^{\frac{33}{}}$ |
|  | Nexus 9300-FX/FX2 switches | $265,000^{34}$ |
|  | Nexus 9700-EX/FX line cards | $174,000^{35}$ |
| VXLAN VLAN logical port VP count | Nexus 9300 and 9500 switches | 7,500 |
| VXLAN VLANs per FEX port (host interface) | Nexus 9300 and 9500 switches | 75 |
| IGMP groups | Nexus 9200, 9300, 9300-EX, 9300-FX/FX2, 9500 switches, and the Nexus 9700-EX/FX line cards | 8,192 |

${ }^{23}$ In case of IR, each VNI can have a max of 64 peers.
${ }^{24}$ In case of IR, each VNI can have a max number of 64 peers
25 This is the limit for the Cisco Nexus 93180 YC-EX and other fiber-based switches. All copper-based 9300-EX switches are not applicable.
Only 1900 SVI are supported if dual stack is used/IPv6 is used.
ECMP objects are not shared across multiple VRFs.
All / 64 routes +4000 for non $/ 64$ routes.
All /64 routes +4000 for non $/ 64$ routes.
All /64 routes +4000 for non / 64 routes.
Only 1900 SVI are supported if dual stack is used/IPv6 is used.
ECMP objects are not shared across multiple VRFs.
All /64 routes +4000 for non / 64 routes.
All / 64 routes +4000 for non / 64 routes.
All / 64 routes +4000 for non $/ 64$ routes.

Table 16: Tetration Verified Scalability Limits (Unidimensional)

| Feature | Supported Platforms | Verified Limit |
| :---: | :---: | :---: |
| TCAM size | Nexus 92160YC-X, 9300-EX, and 9300-FX switches | 1,024 entries |
|  | Nexus 92160YC-X switches | $\operatorname{IPv} 4-4$ entries per rule (TCP, UDP, ICMP, and IP) |
|  | Nexus 9300-EX, and 9300-FX switches | IPv4-2 entries per rule (ICMP and IP) |
|  | Nexus 92160YC-X switches | IPv6 - 8 entries per rule ( 4 entries per ICMP and IPv6 for a total of 8 entries) |
|  | Nexus 9300-EX and 9300-FX switches | IPv6 - 8 entries per rule (4 entries per ICMP and IPv6 for a total of 8 entries) |
|  | Nexus 92160YC-X, 9300-EX, and 9300-FX switches | 24 entries out of 1000 is consumed for default |
| TCAM scale | Nexus 92160YC-X switches | 250 (IPv4) or 62 (IPv6) |
|  | Nexus 9300-EX and 9300-FX switches | 500 (IPv4) or 125 (IPv6) |

The entire Cisco Tetration Analytics documentation set is available at the following URL:
https://www.cisco.com/c/en/us/support/data-center-analytics/tetration-analytics/tsd-products-support-series-home.html

## Verified Scalability Limits - Multidimensional

The tables in this section list the verified scalability limits for the Cisco Nexus 9508 switch with an X9636C-R, X9636C-RX, or X9636Q-R line card or a C9508-FM-R fabric module and Cisco Nexus 9504 with -R line cards for Cisco NX-OS Release 9.2(3). These limits are validated with a multidimensional configuration. The values provided in these tables focus on the scalability of all listed features at the same time.

Each number is the absolute maximum currently supported by this Cisco NX-OS release for the corresponding feature. If the hardware is capable of a higher scale, future software releases might increase this verified maximum limit. Results might differ from the values listed here when trying to achieve maximum scalability with multiple features enabled.


These numbers are not the maximum verified values if each feature is viewed in isolation. For these numbers, see the "Verified Scalability Limits" section.

## Table 17: eBGP/IS-IS Profile Verified Scalability Limits (Multidimensional)

| Feature | Verified Limits |
| :--- | :--- |
| Number of 100G ports | 288 |
| ECMP | 16-way (Upstream) |
| BGP neighbors | 960 |


| Feature | Verified Limits |
| :---: | :---: |
| BGP IPv4 /32 unicast routes | 30,000 |
| BGP IPv4 VLSM unicast routes | 18,000 |
| BGP IPv6 / 128 unicast routes | 16,000 |
| BGP IPv6 VLSM unicast routes | 1,000 |
| IS-IS v2 neighbors | 255 |
| IS-IS v3 neighbors | 255 |
| IS-IS L2 adjacency | 16 |
| IS-IS IPv4 /32 unicast routes | 20,000 |
| IS-IS IPv4 VLSM unicast routes | 1,000 |
| IS-IS IPv6 /128 unicast routes | 20,000 |
| IS-IS IPv6 VLSM unicast routes | 1,000 |
| BFD sessions | 272 |
| PIM neighbors | 256 |
| ACL ACEs | 15,000 |
|  | 500 |
| Sub-interfaces | 712 |
| SPAN sessions | 1 local SPAN session |
| Multicast SSM | 20,000 |

Table 18: iBGP/OSPF Profile Verified Scalability Limits (Multidimensional)

| Feature | Verified Limits |
| :--- | :--- |
| Number of 100G ports | 180 |
| Number of 40G ports | 108 |
| ECMP | 8 -way (Upstream) |
| BGP neighbors | 8 |
| BGP IPv4 VLSM unicast routes | 40,000 |
| BGP IPv6 VLSM unicast routes | 10,000 |
| OSPFv2 neighbors | 108 |


| Feature | Verified Limits |
| :--- | :--- |
| OSPFv3 neighbors | 30 |
| OSPF IPv4 /32 unicast routes | 100,000 |
| OSPF IPv4 VLSM unicast routes | 155,000 |
| OSPFv3 IPv6 /128 unicast routes | 1,000 |
| OSPFv3 IPv6 VLSM unicast routes | 9,000 |
| BFD sessions | 108 |
| VRF | 250 |
| PIM neighbors | 108 |
| IPv4 (*,G) multicast routes | 2,000 |
| IPv4 (S,G) multicast routes | 10,000 |
| ACL ACEs | 500 (IPv4) |
| SPAN sessions | 1 local SPAN session |

Table 19: iBGP/EIGRP Profile Verified Scalability Limits (Multidimensional)

| Feature | Verified Limits |
| :--- | :--- |
| Number of 100G ports | 180 |
| Number of 40G ports | 108 |
| ECMP | 16 -way (Upstream) |
| BGP neighbors | 8 |
| BGP IPv4 VLSM unicast routes | 40,000 |
| BGP IPv6 VLSM unicast routes | 10,000 |
| EIGRP v4 neighbors | 276 |
| EIGRP v6 neighbors | 276 |
| EIGRP IPv4 /32 unicast routes | 30,000 |
| EIGRP IPv4 VLSM unicast routes | 1,000 |
| EIGRP IPv6 /128 unicast routes | 1,000 |
| EIGRP IPv6 VLSM unicast routes |  |


| Feature | Verified Limits |
| :--- | :--- |
| BFD sessions | 276 |
| VRF | 250 |
| PIM neighbors | 276 |
| IPv4 ( $\left.{ }^{*}, \mathrm{G}\right)$ multicast routes | 6,000 |
| IPv4 (S,G) multicast routes | 16,000 |
| ACL ACEs | $500(\operatorname{IPv} 4)$ <br> $500(\operatorname{IPv6)}$ |
| SPAN sessions | 1 local SPAN session |

Table 20: MPLS Verified Scalability Limits (Multidimensional)

| Feature | Verified Limits |
| :--- | :--- |
| MPLS L3VPN | 3967 |
| VPE | 3967 |
| PE nodes | 3 |
| PE routes | 20,000 |
| X9636C-RX line card: ACL - IPv4 | 95,000 |
| X9636C-RX line card: ACL - IPv6 | 20,000 |
| HSRP, HSRP VIP | 3967 each for IPv4 and IPv6 |
| vPC uRPF | 3967 |
| Strict uRPF | 395 |
| VRF | 3967 |
| SVI | 2,000 |
| Layer 3 VPN routes IP ECMP | 2,000 |
| MPLS LSR ECMP | 400,000 |
| VPN IPv4 routes | 90,000 |
| VPN IPv6 routes | 750 |
| EBGP neighbors |  |

Table 21: Layer 2/Layer 3 Boundary Verified Scalability Limits (Multidimensional)

| Feature | Verified Limits |
| :---: | :---: |
| MAC addresses | 19,000 |
| Sub-interfaces | 500 |
| vPC Port channels | 46 |
| ECMP | 16-way (Upstream) |
| OSPFv2 neighbors | 47 |
| OSPFv3 neighbors | 47 |
| OSPF IPv4/32 unicast routes | 45,000 |
| OSPF IPv4 VLSM unicast routes | 1,000 |
| OSPF IPv6 /128 unicast routes | 20,000 |
| OSPF IPv6 VLSM unicast routes | 1,000 |
| BFD sessions | 49 |
| VRF | 250 |
| VLAN | 3,750 |
| SVI | 3,750 |
| VRRP v4 groups | 1,996 VRRS / 4 VRRPv3 |
| VRRP v6 groups | 1,996 VRRS / 4 VRRPv3 |
| HSRP IPv4 | 1,743 Secondary groups / 7 Primary groups |
| HSRP IPv6 | 1,743 Secondary groups / 7 Primary groups |
| PIM neighbors | 396 |
| IPv4 (*,G) multicast routes | 3,080 |
| IPv4 (S,G) multicast routes | 26,600 |
| IGMP snooping database entries | 6,400 |
| sFlow enabled interfaces | 83 |
| UDLD enabled interfaces | 93 |
| SPAN sessions | 1 local SPAN session |

Table 22: Segment Routing Verified Scalability Limits (Multidimensional)

| Feature | Verified Limits |
| :--- | :--- |
| VLAN | 100 |
| SVI | 100 |
| MAC entries | 10,000 |
| ARP entries | 70 |
| HSRPv4 VIPs | 100 |
| HSRpv6 VIPs | 100 |
| LACP | 11 |
| LACP members | 4 |
| eBGP IPv6 neighbors | 9 |
| eBGP IPv4 LU neighbors | 9 |
| IPv4 (LU) routes | 17580 |
| IPv4 (LU) paths | 6,663 |
| IPv6 routes | 17,338 |
| IPv4 (LU) routes | 18 (dual-homed) |
| SR ECMP | 11,957 |
| MPLS HW entries |  |

Table 23: VXLAN Profile Verified Scalability Limits (Multidimensional)

| Feature | Verified Limits |
| :--- | :--- |
| Ports | 16 |
| ECMP | 8 -way (Upstream) |
| BGP neighbors | 200 |
| BGP EVPN Layer 2 VPN host routes | 64,000 |
| BGP IPv4 VLSM unicast routes or ospf | 10,000 |
| BGP IPv6 VLSM unicast routes or ospf | 6,000 |
| BFD sessions | 20 |
| PIM neighbors | 20 |


| Feature | Verified Limits |
| :--- | :--- |
| IPv4 (*, G) multicast routes (co-existing) | 4,000 |
| IPv4 (S,G) multicast routes (co-existing) | 2,000 |
| Layer 3 VNI | 900 |
| Layer 2 VNI | 2000 |
| Local VTEP | 1 |
| Remote VTEPs | 256 |
| VLAN | 3600 |
| SVI | 900 |
| MAC | 90,000 |

## Deployment Case Studies

This section provides sample topologies for some common deployments. For each topology, the scalability numbers are the limits with all of the listed features enabled at the same time.

Attention These numbers are not the maximum verified values if each feature is viewed in isolation. For these numbers, see the "Verified Scalability Limits" section.

## Layer 2/Layer 3 Aggregation Topology (Max-Host Routing Mode)

This Layer 2/Layer 3 aggregation topology consists of Cisco Nexus 9508 switches as virtual port channel (vPC) aggregation pairs. These aggregation nodes are fully loaded with N9K-X9564TX, N9K-X9564PX, and N9K-X9636PQ line cards. The N9K-X9636PQ line cards are used in normal mode and breakout mode. Cisco Nexus 9396PX and 93128TX switches are used as top-of-rack units with Cisco Nexus 3000 Series switches to achieve the desired vPC scale.

The Cisco Nexus 9508 switch is also used as a core Layer 3 node that connects to a pair of vPC aggregation nodes. The focus of the topology is to test IPv4 ARP, IPv6 neighbor discovery (ND), and Layer 2 scalability and other routing, switching, and Layer 4 through Layer 7 features for management and operations. All Layer 3 interfaces are configured for dual stack, and the traffic is dual stack for all VLANs.

In the following table, the Verified Limit column lists the verified scaling capabilities with all listed features enabled at the same time. The scale numbers listed here exceed those used by most customers in their topologies. These numbers are not the maximum verified values if each feature is viewed in isolation.

Table 24: Layer 2/Layer 3 Aggregation Topology (Max-Host Routing Mode)

| Feature | 9508 Verified Limit (Max-Host Routing Mode) |
| :--- | :--- |
| Fully loaded chassis | 1 N9K-X9636PQ, 1 N9K-X9564TX, 2 N9K-X9564PX, 1 N9K-X9432PQ, 1 <br> N9K-X9536PQ |


| Feature | 9508 Verified Limit (Max-Host Routing Mode) |
| :--- | :--- |
| Physical interfaces enabled | 276 |
| Multicast S,G routes | 653 |
| Multicast *,G routes | 500 |
| IPv4 unicast routes (LPM) | 5000 |
| IPv6 unicast routes (LPM) | 850 |
| IPv4 ARP | 65,000 |
| IPv6 ND | 40,000 |
| MAC addresses | 90,000 |
| VLANs | 490 |
| vPCs* | 200 |
| OSPFv2 neighbors | 20 |
| OSPFv3 neighbors | 4 |
| BGP (IPv4) neighbors | 65 |
| BGP (IPv6) neighbors | 65 |
| SVIs | 490 |
| STP logical ports | 8800 (RPVST) |
| HSRP VLANs (IPv4/IPv6) | Virtual ports |
| Port channel links |  |

* The number of VLANs per vPC supported should be within the MST or RPVST virtual port count specified in this table, depending on the topology.


## Layer 2/Layer 3 Aggregation Topology (Default Routing Mode)

This Layer 2/Layer 3 aggregation topology consists of Cisco Nexus 9516 switches as virtual port channel (vPC) aggregation pairs. These aggregation nodes are fully loaded with N9K-X9564TX, N9K-X9564PX, and N9K-X9536PQ line cards. The chassis is fully loaded with five line cards configured for breakout mode. The Cisco Nexus 9396PX and 93128TX switches are used as top-of-rack units with Cisco Nexus 3000 Series switches to achieve the desired vPC scale. The Cisco Nexus 9516 nodes are running in default routing mode. The Cisco Nexus 3164Q switch is also used as a core Layer 3 node that connects to a pair of vPC aggregation nodes.
The focus of the topology is to test IPv4 ARP, IPv6 neighbor discovery (ND), Layer 2 scalability, IPv4 and IPv6 LPM routing, Layer 2 and Layer 3 multicast routing for IPv4, and Layer 4 through Layer 7 features for management and operations. All Layer 3 interfaces are configured for dual stack, and the traffic is dual stack for all VLANs.

In the following table, the Verified Limit column lists the verified scaling capabilities with all listed features enabled at the same time. These numbers are not the maximum verified values if each feature is viewed in isolation.

## Table 25: Layer 2/Layer 3 Aggregation Topology (Default Routing Mode)

| Feature | 9516 Switch Verified Limit (Default Routing Mode) | 9300 Platform Verified Limit (Default Routing Mode) |
| :---: | :---: | :---: |
| Chassis configuration | 5 N9K-X9432PQ line cards 4 N9K-X9464PX line cards 3 N9K-X9536PQ line cards 3 N9K-X9464TX line cards 1 N9K-X9564TX line card | 9372 |
| Physical ports | 1335 | 50 |
| vPCs | 303 | 24 |
| SVIs | 450 | 450 |
| VRFs | 100 | 100 |
| IPv4 ARP | 40,000 | 40,000 |
| IPv6 ND | 10,000 | 10,000 |
| STP logical ports | 10,000 | 6000 |
| BGP neighbors (IPv4 + IPv6) | $502+502$ | $502+502$ |
| IPv4 LPM routes | 50,000 | 6000 |
| IPv6 LPM routes | 10,000 | 1000 |
| BFD (IPv4 + IPv6) | 300 | 102 |
| IGP OSPFv2 neighbors | 502 | 502 |
| IGP OSPFv3 neighbors | 502 | 502 |
| HSRP (IPv4 + IPv6) | $450+450$ | $450+450$ |
| IGMP groups | 2000 | 2000 |
| Multicast *, G routes | 2000 | 2000 |
| Multicast S,G routes | 8000 | 6000 |
| Tracking objects | 450 | 450 |
| VLANs | 500 | 500 |
| PIM neighbors | 502 | 502 |


| Feature | 9516 Switch Verified Limit (Default Routing <br> Mode) | 9300 Platform Verified Limit (Default <br> Routing Mode) |
| :--- | :--- | :--- |
| MAC addresses | 60,000 | 60,000 |
| Network address translation <br> (NAT) | Not applicable | 756 |
| sFlow | 256 | 32 |

## FEX System Topology

The FEX 9500 multi-dimensional scale topology consists of Cisco Nexus 9508 switches as virtual port channel (vPC) pairs. Each switch has multiple X9564PX line cards. Each switch has 32 FEX uplinks connected to them. The FEX 9300 multi-dimensional scale topology consists of two Cisco Nexus 9396PX switches used in vPC mode along with 16 FEX uplinks connected to each switch. Multiple FEXs of type Nexus 2248TP-E, 2232PP, 2248PQ, and 2348UPQ are used.

The switches are used at the Layer 2 and Layer 3 boundary and are also configured as VXLAN VTEPs. The FEX host ports are operating as Layer 2 ports. The switches are configured as gateways with the use of SVI interfaces.

In the following table, the Verified Limit column lists the verified scaling capabilities with all listed features enabled at the same time. The scale numbers listed here exceed those used by most customers in their topologies. These numbers are not the maximum verified values if each feature is viewed in isolation.

Table 26: FEX System Topology

| Feature | $\mathbf{9 5 0 0}$ Platform Verified Limit | 9300 Platform Verified Limit |
| :--- | :--- | :--- |
| Fabric Extenders | 32 | 16 |
| Up interfaces | 1100 | 560 |
| Port channels | 426 | 256 |
| vPC members | 390 | 360 |
| VLANs | 744 | 416 |
| PVLAN VLANs | 56 | 56 |
| Secondary VLANs per primary <br> VLAN | 25 | 25 |
| MAC addresses | 45,000 | 25,000 |
| HSRP | 365 | 365 |
| ARP | 12,000 | 10,000 |
| Neighbor discovery (ND) | 5000 | 4000 |
| Multicast (*,G) | 4000 | 4000 |
| Multicast (S,G) |  |  |

## Multicast System Topology

This multicast system topology consists of two multicast PIM domains. The Multicast Source Discovery Protocol (MSDP) is used to exchange multicast source information between these two domains.
Two Cisco Nexus 9508 switches are configured as vPC peers in one domain, and two Cisco Nexus 9372PX switches are configured as vPC peers in the other domain. The chassis are fully loaded with N9K-X9432PQ, N9K-X9464PX, N9K-X9536PQ, N9K-X9564PX, N9K-X9564TX, and N9K-X9636PQ line cards. eBGP routing is used to connect these two PIM domains. OSPF is used as IGP in one domain, and EIGRP is configured in the other domain. This setup is configured with multiple rendezvous points (RPs) to serve different multicast group ranges. BSR is used to advertise RP information in both of these PIM domains. PIM anycast is used in one domain, and MSDP anycast is used in the other domain for redundancy and load balancing. Static RP configuration is also used for a range of multicast groups.

The Cisco Nexus 9516 and Cisco Nexus 7000 Series switches are used as Layer 3 core routers in one domain. The Cisco Nexus 3164Q switches are used as Layer 3 core routers in the other domain. This topology also includes the Cisco Nexus 9396PX, Cisco Nexus 9372PX, and Cisco Nexus 3016/3064T switches in the access layer.

In addition to including Layer 2/Layer 3 IPv4 multicast routing, this topology also covers IPv4 and IPv6 host and LPM routing and Layer 2 unicast forwarding. All interfaces are configured for dual stack.
In the following table, the Verified Limit column lists the verified scaling capabilities with all listed features enabled at the same time. These numbers are not the maximum verified values if each feature is viewed in isolation.

Table 27: Multicast System Topology

| Feature | 9500 Platform Verified Limit | 9300 Platform Verified Limit |
| :--- | :--- | :--- |
| Chassis configuration | N9K-X9636PQ, N9K-X9536PQ, <br> N9K-X9564PX, N9K-X9564TX, <br> N9K-X9432PQ, N9K-X9464PX, <br> N9K-X9432PQ, C3164PQ | C9372PX, C9396PX, C3164PQ |
| Multicast S,G routes | 17,500 | 500 (IGMP) <br> Multicast *,G routes <br> Sources <br> Replications <br> 12500 (snooping) |
| ECMPs | $2000,200,100,40,10,3,2,1$ | $2000,200,100,40,10,3,2,1$ |
| SVIs | 40 | 20 |
| HSRP/VRRP | 16 | 8 |
| MAC addresses | 200 | 200 |
| ARP | 200 HSRP | 100 VRRP |
| Unicast LPM IPv4 routes | 20,000 | 10,000 |
| Unicast LPM IPv6 routes | 10,000 | 4000 |
| IPv4 ARP | 18,000 | 4000 |


| Feature | $\mathbf{9 5 0 0}$ Platform Verified Limit | $\mathbf{9 3 0 0}$ Platform Verified Limit |
| :--- | :--- | :--- |
| IPv6 ND | 4000 | 2000 |
| MSDP peers (fully mesh) | 4 | 4 |
| Anycast RPs (MSDP and PIM <br> anycast) | 2 MSDP | 2 PIM anycast |
| IPv4 multicast routes with PIM <br> bidirectional groups | 8000 | 8000 |

## VXLAN BGP/eVPN iBGP Centric Topology

This VXLAN BGP/eVPN iBGP centric topology consists of Cisco Nexus 9300 and 9500 Platform switches acting as VXLAN vPC tunnel endpoints (VTEPs) and VXLAN non-vPC VTEPs. VXLAN VTEPs establish iBGP sessions to a Cisco Nexus 9508 switch (route reflector) acting as a spine node. VXLAN-distributed anycast gateway SVIs are configured for dual stack, and the traffic is dual stack.

The focus of this topology is to test VXLAN overlay network scale and underlay Layer 2 switching and other routing, multicast, and Layer 4 through Layer 7 features for management and operations. Underlay PIM neighbors and IS-IS adjacency were tested with the default timer and Bidirectional Forwarding Detection (BFD) enabled on all links.

In the following table, the Verified Limit column lists the verified scaling capabilities with all listed features enabled at the same time. These numbers are not the maximum verified values if each feature is viewed in isolation.

Table 28: VXLAN BGP/eVPN iBGP Centric Topology

| Feature | Supported Platform | Verified Limit |
| :--- | :--- | :--- |
| System Routing Template | Nexus 9200, 9300, 9300-EX, 9300-FX, and <br> 9500 switches and the X9700-EX/FX line <br> cards | default |
|  | Nexus 9364C switches | Not applicable |
| VXLAN VTEPs | Nexus 9200, 9300, 9300-EX, 9300-FX, <br> 9364 C and 9500 switches and the <br> X9700-EX/FX line cards | 128 |
| VXLAN Layer 2 VNIs | Nexus 9200, 9300, 9300-EX, 9300-FX, <br> 9364 C and 9500 switches and the <br> X9700-EX/FX line cards | 2000 |
| VXLAN Layer 3 VNIs/VRFs | Nexus 9200, 9300, 9300-EX, 9300-FX, <br> 9364 C and 9500 switches and the <br> X9700-EX/FX line cards | 500 |
| VXLAN multicast groups | Nexus 9200, 9300, 9300-EX, 9300-FX, <br> $9364 C$ and 9500 switches and the <br> X9700-EX/FX line cards | 128 |


| Feature | Supported Platform | Verified Limit |
| :---: | :---: | :---: |
| VXLAN overlay MAC addresses | Nexus 9200, 9300, 9300-EX, 9300-FX, 9364 C and 9500 switches and the X9700-EX/FX line cards | 64,000 |
| VXLAN overlay IPv4 host routes | Nexus 9200, 9300, 9300-EX, 9300-FX, 9364C and 9500 switches and the X9700-EX/FX line cards | 60,000 |
| VXLAN overlay IPv6 host routes | Nexus 9200, 9300, 9300-EX, 9300-FX, and 9500 switches and the X9700-EX/FX line cards | 16,000 |
|  | Nexus 9364C switches | Not applicable |
| VXLAN overlay IGMP Snooping groups | Nexus 9200, 9300, 9300-EX, 9300-FX, 9364C and 9500 switches and the X9700-EX/FX line cards | 1000 |
| VXLAN IPv4 LPM routes | Nexus 9200, 9300-EX, 9300-FX, and 9364C switches and the X9700-EX/FX line cards | 5120 |
| VXLAN IPv6 LPM routes | Nexus 9200, 9300-EX, and 9300-FX switches and the X9700-EX/FX line cards | 1500 |
|  | Nexus 9364C switches | Not applicable |
| VXLAN VLAN logical port VP count | Nexus 9364C switches | Not applicable |
| VLANs on VTEP node | Nexus 9200, 9300, 9300-EX, 9300-FX, 9364 C , and 9500 switches and the X9700-EX/FX line cards | $\begin{aligned} & 1700 \text { (total VLANs) } \\ & 1500 \text { (VXLAN VLANs) } \\ & 200 \text { (non-VXLAN VLANs) } \end{aligned}$ |
| MST instances | Nexus 9200, 9300, 9300-EX, 9300-FX, and 9500 switches and the X9700-EX/FX line cards | 20 |
|  | Nexus 9364C switches | Not applicable |
| STP logical ports | Nexus 9200, 9300, 9300-EX, 9300-FX, and 9500 switches and the X9700-EX/FX line cards | 3500 |
|  | Nexus 9364C switches | Not applicable |
| vPC port channels | Nexus 9200, 9300, 9300-EX, and 9300-FX switches and the X9700-EX/FX line cards | 40 |
|  | Nexus 9364C switches | Not applicable |


| Feature | Supported Platform | Verified Limit |
| :--- | :--- | :--- |
| Underlay IS-IS neighbors | Nexus 9200, 9300, 9300-EX, and 9300-FX <br> switches and the X9700-EX/FX line cards | 32 |
|  | Nexus 9364C switches | Not applicable |
| Underlay PIM neighbors | Nexus 9200, 9300, 9300-EX, 9300-FX, and <br> 9500 switches and the X9700-EX/FX line <br> cards | 12 |
|  | Nexus 9364C switches | Not applicable |
| Underlay HSRP groups for regular VLANs | Nexus 9364C switches | Not applicable |
| Underlay vPC SVIs | Nexus 9200, 9300, 9300-EX, 9300-FX, and <br> 9500 switches and the X9700-EX/FX line <br> cards | 200 |
|  | Nexus 9364C switches | Not applicable |

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: $\mathrm{http}: / / \mathrm{www} . c i s c o . c o m / \mathrm{go} /$ softwareterms.Cisco product warranty information is available at http://www.cisco.com/go/warranty. US Federal Communications Commission Notices are found here http://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: www.cisco.com go trademarks. 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)
© 2019-2020 Cisco Systems, Inc. All rights reserved.
> -1|lı|l. CISCO. Cisco Systems, Inc. USA

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

