Cisco Nexus 9000 Series NX-OS Verified Scalability Guide, Release 6.1(2)I3(2), 6.1(2)I3(3), and 6.1(2)I3(3a)

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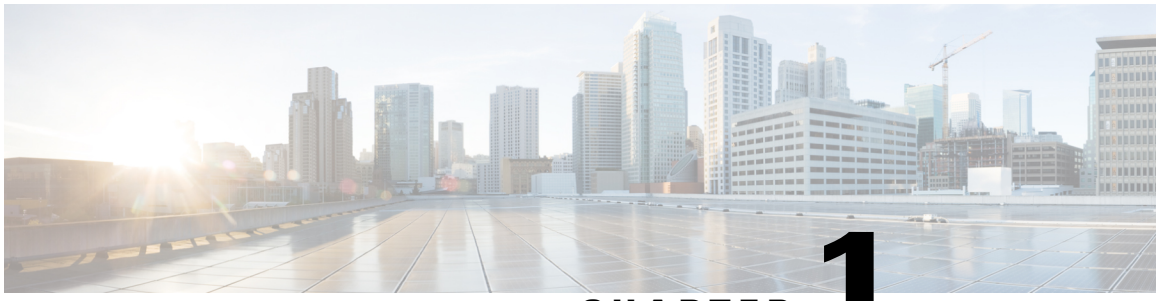

CHAPTER 1

Verified Scalability Limits

This chapter describes the Cisco NX-OS configuration limits for the Cisco Nexus 9000 Series switches.

Introduction

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

The tables in this section list the unidimensional verified scalability limits for Cisco NX-OS Releases 6.1(2)I3(2), 6.1(2)I3(3), and 6.1(2)I3(3a). These limits are validated with a unidimensional configuration. The values provided in these tables focus on the scalability of one particular feature at a 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.

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

Feature	9500 Series Verified Limit	9300 Series Verified Limit
Number of Fabric Extenders and total number of Fabric Extender server interfaces	Not applicable	16 and 768
Number of VLANs per Fabric Extender	Not applicable	2000 (across all Fabric Extenders)

Feature	9500 Series Verified Limit	9300 Series Verified Limit
Number of VLANs per Fabric Extender server interface	Not applicable	75
Number of port channels	Not applicable	500

Note The Cisco Nexus 2000 Series Fabric Extender is supported only with the Cisco Nexus 9396PX and Cisco Nexus 9372PX chassis.

Table 2: Interfaces Verified Scalability Limits (Unidimensional)

Feature	9500 Series Verified Limit	9300 Series Verified Limit
Generic routing encapsulation (GRE) tunnels	8	8
Port channel links	32	8
SVIs	490	250
vPCs	275	100 (280 with Fabric Extenders)

Table 3: Layer 2 Switching Verified Scalability Limits (Unidimensional)

Feature	9500 Series Verified Limit	9300 Series Verified Limit
MST instances	64	64
MST virtual ports	85,000	48,000
RPVST virtual ports	22,000	12,000
VLANs	4000	3900
VLANs in RPVST mode	500	500

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

Table 4: Multicast Routing Verified Scalability Limits (Unidimensional)

Feature	9500 Series Verified Limit	9300 Series Verified Limit
IPv4 multicast routes	32,000	8000
Outgoing interfaces (OIFs)	40	40

Note 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.

Note High availability (graceful restart and stateful switchover) is not supported when unicast or multicast aggressive timers are configured at any scale.

Table 5: Security Verified Scalability Limits (Unidimensional)

Feature	9500 Series Verified Limit	9300 Series Verified Limit
IPv4 ingress ACLs	3072 (per network forwarding engine)	3072 (per network forwarding engine)
IPv4 egress ACLs	768 (per network forwarding engine)	768 (per network forwarding engine)
IPv6 ingress ACLs	1536 (per network forwarding engine)	1536 (per network forwarding engine)
IPv6 egress ACLs	256 (per network forwarding engine)	256 (per network forwarding engine)

Note The ACL scalability limits also apply to policy-based ACLs (PBACLs).

Table 6: System Management Verified Scalability Limits (Unidimensional)

Feature	9500 Series Verified Limit	9300 Series Verified Limit
Configurable SPAN or ERSPAN sessions	32	4
Active SPAN or ERSPAN sessions[1]	4 to 32, based on the number of line cards and the session configuration	4

Feature	9500 Series Verified Limit	9300 Series Verified Limit
Active localized SPAN or ERSPAN sessions per line card[2]	4	4
Source interfaces per SPAN or ERSPAN session (Rx and Tx, Rx, or Tx)	48	48
Destination interfaces per SPAN session	1 (physical interface)	1 (physical interface)
Source VLANs per SPAN or ERSPAN session	32	32

1 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.

2 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.

Table 7: Unicast Routing Verified Scalability Limits (Unidimensional)

Feature	9500 Series Verified Limit	9300 Series Verified Limit
BGP neighbors	1000	150
HSRP groups per interface or I/O module	490	250
IPv4 ARP	60,000	45,000
IPv4 host routes	88,000 60,000 (max host mode)	90,000
IPv6 host routes	20,000 30,000 (max host mode)	40,000
IPv6 ND	30,000	20,000
IPv4 unicast routes (LPM)	128,000 16,000 (max host mode) 128,000 with no IPv6 routes (64-bit ALPM mode)	12,000
IPv6 unicast routes (LPM)	20,000 4000 (max host mode) 80,000 with no IPv4 routes (64-bit ALPM mode)	6000 (5000 routes < /64, 1000 routes > /64)

Feature	9500 Series Verified Limit	9300 Series Verified Limit
IPv4 and IPv6 unicast routes (LPM) in 64-bit ALPM mode	*x* IPv6 routes and *y* IPv4 routes, where $2x + y <= 128,000$	Not applicable
MAC addresses	90,000	90,000
OSPFv2 neighbors	1000	200
OSPFv3 neighbors	300	200
VRFs	1000	500
VRRP groups per interface or I/O module	250	250
Policy-based routing (PBR)		
Number of configured sequences per policy	256	256
Number of next-hop addresses per policy	32	32
Number of IPv4 ACEs (unidimensional)	3072 (per network forwarding engine)	3072 (per network forwarding engine)
Number of IPv6 ACEs (unidimensional)	1536 (per network forwarding engine)	1536 (per network forwarding engine)
Number of IPv4 and IPv6s ACEs	2048 IPv4 + 256 IPv6	2048 IPv4 + 256 IPv6
Number of interfaces with PBR policy	512	512

Note 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.

Note 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.

Note 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 8: VXLAN Verified Scalability Limits (Unidimensional)

Feature	9500 Series Verified Limit	9300 Series Verified Limit
Virtual network identifiers (VNIs) or VXLAN-mapped VLANs	Not applicable	1000
Overlay multicast groups	Not applicable	128
Overlay MAC addresses	Not applicable	64,000
Remote VXLAN tunnel endpoints (VTEPs)	Not applicable	256

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 Verified Scalability Limits, on page 1.

Verified Scalability Limits for a 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 9: Verified Scalability Limits for a Layer 2/Layer 3 Aggregation Topology (Max-Host Routing Mode)

Feature	9500 Series Verified Limit (Max-Host Routing Mode)	9300 Series Verified Limit
Fully loaded chassis	6 N9636PQ line cards + 1 N9564TX line card + 1 N9564PX line card + 6 fabric modules + 2 system controllers + 2 supervisors	Not applicable
Physical interfaces enabled	300	Not applicable
Multicast S,G routes	500	Not applicable
Multicast *,G routes	500	Not applicable
IPv4 unicast routes (LPM)	2400	2200
IPv6 unicast routes (LPM)	2200	2200
IPv4 ARP	60,000	5000
IPv6 ND	30,000	5000
MAC addresses	90,000	72,000
VLANs	500 (RPVST)	3900 (MST)
vPCs*	275	100
OSPFv2 neighbors	16	200
OSPFv3 neighbors	16	200
BGP (IPv4) neighbors	64 (eBGP)	150 (iBGP)
BGP (IPv6) neighbors	64 (eBGP)	150 (iBGP)
SVIs	490	250
MST instances	Not applicable	64
HSRP VLANs (IPv4/IPv6)	490	250
Virtual ports	3000 (RPVST)	24,000 (MST)
Port channel links	32	8

* 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.