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AOS-CX IPV6 QUICK START GUIDE

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Introduction

IPv6 is becoming a priority, due the exhaustion of the IPv4 address space, technologies like 5G, cloud, Internet of things (IoT) require its use, governments and standard bodies demand it, and the device/network/content communication value chain are calling for its adoption.

It is assumed the reader has knowledge of IPv6 fundamentals and now requires guidance on deploying IPv6 on AOS-CX switches.

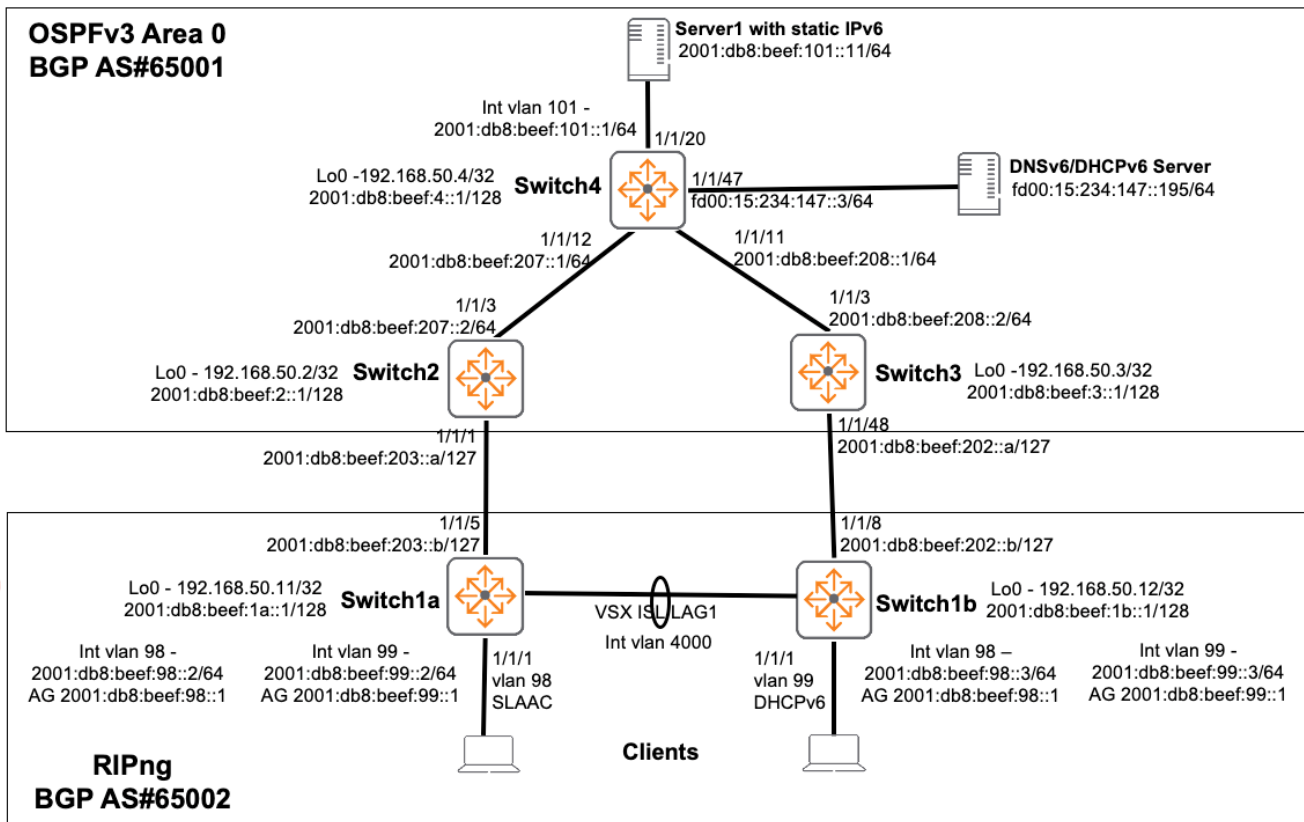
The IPv6 commands and features described in this document can be used in a native IPv6 network or in a dual stack IPv4/IPv6 network.

This guide covers the following IPv6 related features:

- DHCPv6 and DNSv6 resolution on an AOS-CX switch
- OSPFv3
- RIPng
- MP-BGP
- Virtual Switching Extension (VSX) IPv6 Active Gateways
- Client IPv6 address assignment using Stateless Address Autoconfiguration (SLAAC) and DHCPv6

The topology shown in Figure 1 will be used to describe the various IPv6 features mentioned in this guide.

Figure 1. Example IPv6 topology



Switch4 is connected to Server1 and a DNSv6/DHCPv6 server with static IPv6 addresses. Switch2, Switch3 and Switch4 utilize OSPFv3 as the interior gateway protocol (IGP) to share subnets and loopback IPs between switches in the same BGP Autonomous System (AS)#65001.

Switch1a and Switch1b are enabled with VSX and have client facing VLANs (98 – SLAAC, 99 – DHCPv6) with active gateways (AG), RIPng is used as the IGP to share loopback IPs between switches in the same BGP AS#65002.

EBGP is used to share and learn routes between the different AS#.

DHCPv6 and DNSv6 resolution on an AOS-CX switch

DHCPv6 and DNSv6 resolution on “vrf mgmt”

On an AOS-CX switch, “int mgmt” is placed into “vrf mgmt” by default.

DHCP client is enabled by default on “int mgmt”.

```
Switch4# sh run int mgmt
interface mgmt
    no shutdown
    ip dhcp
```

SLAAC is not currently supported on “int mgmt”, if you connect this port to a DHCPv6 enabled network, it will be able to grab IPv6 and DNSv6 server information.

```
Switch4# sh int mgmt
Address Mode: dhcp
Admin State: up
Mac Address: d0:67:26:49:cc:f3
IPv4 address/subnet-mask:
Default gateway IPv4:
IPv6 address/prefix: fd00:15:234:147:ad85:3878:c2c1:309e/64
IPv6 link local address/prefix: fe80::d267:26ff:fe49:ccf3/64
Default gateway IPv6: fe80::7a48:59ff:fee1:5401
Primary Nameserver: fd00:15:234:147::195
Secondary Nameserver:
```

If you set a static IP on “int mgmt”, you will need to input a static DNSv6 server entry linked to “vrf mgmt”

```
Switch4(config)# ip dns server-address fd00:15:234:147::195 vrf mgmt
```

You can validate DNSv6 resolution by using ping6 with vrf mgmt.

```
Switch4# ping6 server1.tme.internal vrf mgmt
PING server1.tme.internal(2001:db8:beef:101::11) 100 data bytes
108 bytes from 2001:db8:beef:101::11: icmp_seq=1 ttl=64 time=0.637 ms
108 bytes from 2001:db8:beef:101::11: icmp_seq=2 ttl=64 time=0.525 ms
```

DHCPv6 and DNSv6 resolution on “vrf default”

Interfaces on “vrf default” typically have static IPv6 addresses assigned.

```
Switch4# sh run int 1/1/47
interface 1/1/47
  no shutdown
  ipv6 address fd00:15:234:147::3/64
!
ip dns server-address fd00:15:234:147::195
```

You will need to input a static DNSv6 server entry without a VRF assigned at the end.

On 6000 series switches, it is also possible to enable DHCP on an “int vlan” assigned to “vrf default”.

```
6300# sh run int vlan 1
interface vlan1
  ip dhcp
```

Only SLAAC is supported on “int vlan 1” on 6000 series switches.

You can validate DNSv6 resolution by using ping6.

```
Switch4# ping6 server1.tme.internal
PING server1.tme.internal(2001:db8:beef:101::11) 100 data bytes
108 bytes from 2001:db8:beef:101::11: icmp_seq=1 ttl=64 time=0.587 ms
108 bytes from 2001:db8:beef:101::11: icmp_seq=2 ttl=64 time=0.515 ms
108 bytes from 2001:db8:beef:101::11: icmp_seq=3 ttl=64 time=0.637 ms
```

OSPFv3

OSPFv3 is a commonly used IGP in many enterprise networks and is part of AS#65001 in our example.

OSPFv3 requires an IPv4 router ID, each switch has Lo0 with a /32 IPv4 address assigned to it for this purpose.

In this example, Switch2/3/4 utilize OSPFv3 to advertise and learn subnets such as 2001:db8:beef:101::/64 (connected to Server1), fd00:15:234:147::/64 (connected to DNSv6/DHCPv6 server) and Lo0 IPv6 addresses.

Switch2

Here are relevant OSPFv3 configs for Switch2.

```
interface loopback 0
  ip address 192.168.50.2/32
  ipv6 address 2001:db8:beef:2::1/128
  ipv6 ospfv3 1 area 0.0.0.0
! IPv6 Lo0 IP are advertised into OSPFv3 for IBGP peering
!
router ospfv3 1
  router-id 192.168.50.2
! router-id should be IPv4 address from Lo0
  area 0.0.0.0
```

```

interface 1/1/3
  no shutdown
  description Switch4
  ipv6 address 2001:db8:beef:207::2/64
  ipv6 ospfv3 1 area 0.0.0.0
  ipv6 ospfv3 network point-to-point

```

Here are relevant OSPFv3 output after the other OSPFv3 switches are configured.

```

Switch2# show ipv6 ospfv3 neighbors
OSPFv3 Process ID 1 VRF default
=====
Total Number of Neighbors: 1

```

Neighbor ID	Priority	State	Interface
192.168.50.4	n/a	FULL	1/1/3
Neighbor address fe80::d067:2601:3049:ccf2			

Output of learned OSPFv3 routes.

```

Switch2# show ipv6 route ospf

```

Displaying ipv6 routes selected for forwarding

'[x/y]' denotes [distance/metric]

```

2001:db8:beef:3::1/128, vrf default
  via fe80::d067:2601:3049:ccf2%1/1/3, [110/20], ospf
2001:db8:beef:4::1/128, vrf default
  via fe80::d067:2601:3049:ccf2%1/1/3, [110/10], ospf
2001:db8:beef:101::/64, vrf default
  via fe80::d067:2601:3049:ccf2%1/1/3, [110/110], ospf
2001:db8:beef:208::/64, vrf default
  via fe80::d067:2601:3049:ccf2%1/1/3, [110/20], ospf
fd00:15:234:147::/64, vrf default
  via fe80::d067:2601:3049:ccf2%1/1/3, [110/20], ospf

```

Switch3

Here are relevant OSPFv3 configs for Switch3.

```

interface loopback 0
  ip address 192.168.50.3/32
  ipv6 address 2001:db8:beef:3::1/128
  ipv6 ospfv3 1 area 0.0.0.0
! IPv6 Lo0 IP are advertised into OSPFv3 for IBGP peering
!
router ospfv3 1
  router-id 192.168.50.3
! router-id should be IPv4 address from Lo0

```

```

    area 0.0.0.0
interface 1/1/3
    no shutdown
    description Switch4
    ipv6 address 2001:db8:beef:208::2/64
    ipv6 ospfv3 1 area 0.0.0.0
    ipv6 ospfv3 network point-to-point

```

Here are relevant OSPFv3 output after the other OSPFv3 switches are configured.

```
Switch3# show ipv6 ospfv3 neighbors
```

```
OSPFv3 Process ID 1 VRF default
```

```
=====
```

```
Total Number of Neighbors: 1
```

Neighbor ID	Priority	State	Interface
192.168.50.4	n/a	FULL	1/1/3
Neighbor address fe80::d067:2601:2c49:ccf2			

Output of learned OSPFv3 routes.

```
Switch3# show ipv6 route ospf
```

Displaying ipv6 routes selected for forwarding

'[x/y]' denotes [distance/metric]

```

2001:db8:beef:2::1/128, vrf default
    via fe80::d067:2601:2c49:ccf2%1/1/3, [110/20], ospf
2001:db8:beef:4::1/128, vrf default
    via fe80::d067:2601:2c49:ccf2%1/1/3, [110/10], ospf
2001:db8:beef:101::/64, vrf default
    via fe80::d067:2601:2c49:ccf2%1/1/3, [110/110], ospf
2001:db8:beef:207::/64, vrf default
    via fe80::d067:2601:2c49:ccf2%1/1/3, [110/20], ospf
fd00:15:234:147::/64, vrf default
    via fe80::d067:2601:2c49:ccf2%1/1/3, [110/20], ospf

```

Switch4

Here are relevant OSPFv3 configs for Switch4.

```

interface loopback 0
    ip address 192.168.50.4/32
    ipv6 address 2001:db8:beef:4::1/128
    ipv6 ospfv3 1 area 0.0.0.0
! IPv6 Lo0 IP are advertised into OSPFv3 for IBGP peering
!
router ospfv3 1
    router-id 192.168.50.4

```

```

! router-id should be IPv4 address from Lo0
  area 0.0.0.0
interface 1/1/11
  no shutdown
  description Switch3
  ipv6 address 2001:db8:beef:208::1/64
  ipv6 ospfv3 1 area 0.0.0.0
  ipv6 ospfv3 network point-to-point
interface 1/1/12
  no shutdown
  description Switch2
  ipv6 address 2001:db8:beef:207::1/64
  ipv6 ospfv3 1 area 0.0.0.0
  ipv6 ospfv3 network point-to-point

```

Here are relevant OSPFv3 output after the other OSPFv3 switches are configured.

```

Switch3# show ipv6 ospfv3 neighbors
OSPFv3 Process ID 1 VRF default
=====
Total Number of Neighbors: 2

Neighbor ID      Priority  State          Interface
-----
192.168.50.3    n/a      FULL           1/1/11
  Neighbor address fe80::d067:2601:ce2:3670
192.168.50.2    n/a      FULL           1/1/12
  Neighbor address fe80::d067:2601:ce2:b6d2

```

Output of learned OSPFv3 routes.

```
Switch3# show ipv6 route ospf
```

Displaying ipv6 routes selected for forwarding

'[x/y]' denotes [distance/metric]

```

2001:db8:beef:2::1/128, vrf default
  via fe80::d067:2601:ce2:b6d2%1/1/12, [110/10], ospf
2001:db8:beef:3::1/128, vrf default
  via fe80::d067:2601:ce2:3670%1/1/11, [110/10], ospf

```


RIPng

RIPng is an alternative IGP that can be used in smaller networks, RIPng does not require an IPv4 router-ID and is part of AS#65002 in our example.

Switch1a/1b utilize RIPng to advertise and learn Lo0 IPv6 addresses, RIPng neighbors are established through transit VLAN 4000.

Switch1a

Here are relevant RIPng configs for Switch1a.

```
router ripng 1
!
interface loopback 0
  ipv6 address 2001:db8:beef:1a::1/128
  ipv6 ripng 1
interface vlan 4000
  description Transit
  ipv6 address 2001:db8:beef:4000::2/64
  ipv6 ripng 1
```

Here are relevant RIPng output after Switch1b is configured.

```
Switch1a# show ipv6 ripng neighbors
```

```
VRF : default                               Process-ID : 1
```

```
-----
Total Number of Neighbors: 1
-----
```

Peer-Address	Type	Last Heard Time	Rcvd-Bad-Pkts	Rcvd-Bad-Routes
fe80::9020:c28f:a0bb:4100	RIPng	1y:01m:14d	0	0

Output of learned RIPng routes.

```
Switch1a# show ipv6 route rip
```

```
Displaying ipv6 routes selected for forwarding
```

```
'[x/y]' denotes [distance/metric]
```

```
2001:db8:beef:1b::1/128, vrf default
```

```
  via fe80::9020:c28f:a0bb:4100%vlan4000, [120/2], rip
```

Switch1b

Here are relevant RIPng configs for Switch1b.

```
router ripng 1
!
interface loopback 0
```

```

ipv6 address 2001:db8:beef:1b::1/128
ipv6 ripng 1
interface vlan 4000
description Transit
ipv6 address 2001:db8:beef:4000::1/64
ipv6 ripng 1

```

Here are relevant RIPng output after Switch1a is configured.

```

Switch1b# show ipv6 ripng neighbors
VRF : default                               Process-ID : 1
-----
Total Number of Neighbors: 1
-----
Peer-Address      Type      Last Heard Time      Rcvd-Bad-Pkts      Rcvd-Bad-Routes
-----
fe80::9020:c28f:a0ba:c500
                  RIPng     1y:01m:15d          0                   0

```

Output of learned RIPng routes.

```

Switch1b# show ipv6 route rip
Displaying ipv6 routes selected for forwarding

'[x/y]' denotes [distance/metric]

2001:db8:beef:1a::1/128, vrf default
    via fe80::9020:c28f:a0ba:c500%vlan4000, [120/2], rip

```

MP-BGP

MP-BGP supports the IPv6 unicast address family and is used for external route connectivity outside of a BGP domain, e.g. default route from Switch2/3 to Switch4, or 2001:db8:beef:98::/63 summary route from AS#65002 to AS#65001.

MP-BGP requires an IPv4 router ID, each switch has Lo0 with a /32 IPv4 address assigned to it for this purpose.

IBGP peers within an AS# utilize Lo0 IPv6 address as source IP for BGP establishment, Lo0 IPv6 address is learnt via either OSPFv3 or RIPng.

IBGP requires full mesh peering for BGP routers within an AS. Route Reflectors (RR) can be used in larger networks to avoid the full mesh IBGP requirement.

EBGP peers between AS#s utilize directly connected subnets (/64 subnet reserved but /127 is used) for peering.

Switch2

Here are BGP related configs for Switch2 in AS#65001.

```

interface 1/1/1
no shutdown
description Switch1a

```

```

    ipv6 address 2001:db8:beef:203::a/127
!
ipv6 prefix-list accept65002 seq 10 permit 2001:db8:beef:98::/63
!
route-map accept65002 permit seq 10
    match ipv6 address prefix-list accept65002
! A prefix list and route-map is created to only accept desired routes from AS#65002
!
router bgp 65001
    neighbor 2001:db8:beef:203::b remote-as 65002
    neighbor 2001:db8:beef:3::1 remote-as 65001
    neighbor 2001:db8:beef:3::1 update-source loopback 0
    neighbor 2001:db8:beef:4::1 remote-as 65001
    neighbor 2001:db8:beef:4::1 update-source loopback 0
! Lo0 used for IBGP peering
    address-family ipv6 unicast
        neighbor 2001:db8:beef:203::b activate
        neighbor 2001:db8:beef:203::b route-map accept65002 in
! Route-map to match desired routes from AS#65002 is assigned to neighbor
        neighbor 2001:db8:beef:3::1 activate
        neighbor 2001:db8:beef:3::1 next-hop-self
! Used to provide a valid next hop for peers
        neighbor 2001:db8:beef:4::1 activate
        neighbor 2001:db8:beef:4::1 default-originate
! Used to advertise a default route towards a peer
        neighbor 2001:db8:beef:4::1 next-hop-self
        network 2001:db8:beef:101::/64
        network fd00:15:234:147::/64
! Used to advertise desired AS#65001 routes out to AS#65002

```

Here are relevant BGP output after the other BGP neighbors are configured.

```

Switch2# show bgp ipv6 unicast summary
VRF : default
BGP Summary
-----

```

```

Local AS           : 65001           BGP Router Identifier : 192.168.50.2
Peers              : 3               Log Neighbor Changes  : No
Cfg. Hold Time    : 180             Cfg. Keep Alive       : 60

```

Neighbor	Remote-AS	MsgRcvd	MsgSent	Up/Down	Time	State	AdminStatus
2001:db8:beef:203::b	65002	7903	7908	17h:32m:36s		Established	Up
2001:db8:beef:3::1	65001	6603	6629	03d:23h:45m		Established	Up
2001:db8:beef:4::1	65001	12840	12838	03d:23h:48m		Established	Up

```
Switch2# show ipv6 route bgp
Displaying ipv6 routes selected for forwarding

'[x/y]' denotes [distance/metric]

2001:db8:beef:98::/63, vrf default
    via 2001:db8:beef:203::b, [20/0], bgp
```

Switch3

Here are BGP related configs for Switch3 in AS#65001.

```
interface 1/1/48
    no shutdown
    description Switch1b
    ipv6 address 2001:db8:beef:202::a/127
!
ipv6 prefix-list accept65002 seq 10 permit 2001:db8:beef:98::/63
!
route-map accept65002 permit seq 10
    match ipv6 address prefix-list accept65002
! A prefix list and route-map is created to only accept desired routes from AS#65002
!
router bgp 65001
    neighbor 2001:db8:beef:202::b remote-as 65002
    neighbor 2001:db8:beef:2::1 remote-as 65001
    neighbor 2001:db8:beef:2::1 update-source loopback 0
    neighbor 2001:db8:beef:4::1 remote-as 65001
    neighbor 2001:db8:beef:4::1 update-source loopback 0
! Lo0 used for IBGP peering
    address-family ipv6 unicast
        neighbor 2001:db8:beef:202::b activate
        neighbor 2001:db8:beef:202::b route-map accept65002 in
! Route-map to match desired routes from AS#65002 is assigned to neighbor
    neighbor 2001:db8:beef:2::1 activate
    neighbor 2001:db8:beef:2::1 next-hop-self
! Used to provide a valid next hop for peers
    neighbor 2001:db8:beef:4::1 activate
    neighbor 2001:db8:beef:4::1 default-originate
! Used to advertise a default route towards a peer
    neighbor 2001:db8:beef:4::1 next-hop-self
    network 2001:db8:beef:101::/64
    network fd00:15:234:147::/64
! Used to advertise desired AS#65001 routes out to AS#65002
```

Here are relevant BGP output after the other BGP neighbors are configured.

```
Switch3# show bgp ipv6 unicast summary
VRF : default
BGP Summary
-----
```

```

Local AS           : 65001           BGP Router Identifier : 192.168.50.3
Peers              : 3               Log Neighbor Changes  : No
Cfg. Hold Time    : 180            Cfg. Keep Alive       : 60

```

Neighbor	Remote-AS	MsgRcvd	MsgSent	Up/Down Time	State	AdminStatus
2001:db8:beef:202::b						
	65002	7897	7900	17h:36m:21s	Established	Up
2001:db8:beef:2::1						
	65001	6633	6610	03d:23h:49m	Established	Up
2001:db8:beef:4::1						
	65001	12877	12852	03d:23h:52m	Established	Up

```

Switch3# show ipv6 route bgp
Displaying ipv6 routes selected for forwarding

```

'[x/y]' denotes [distance/metric]

```

2001:db8:beef:98::/63, vrf default
    via 2001:db8:beef:202::b, [20/0], bgp

```

Switch4

Here are BGP related configs for Switch4 in AS#65001.

```

router bgp 65001
  neighbor 2001:db8:beef:2::1 remote-as 65001
  neighbor 2001:db8:beef:2::1 update-source loopback 0
  neighbor 2001:db8:beef:3::1 remote-as 65001
  neighbor 2001:db8:beef:3::1 update-source loopback 0
  address-family ipv6 unicast
    neighbor 2001:db8:beef:2::1 activate
    neighbor 2001:db8:beef:3::1 activate

```

Here are relevant IBGP output after the other IBGP switches are configured.

```

Switch4# show bgp ipv6 unicast summary

```

VRF : default

BGP Summary

```

Local AS           : 65001           BGP Router Identifier : 192.168.50.4
Peers              : 2               Log Neighbor Changes  : No
Cfg. Hold Time    : 180            Cfg. Keep Alive       : 60

```

Neighbor	Remote-AS	MsgRcvd	MsgSent	Up/Down Time	State	AdminStatus
2001:db8:beef:2::1						
	65001	5354	5360	03d:05h:37m	Established	Up
2001:db8:beef:3::1						
	65001	5367	5360	03d:05h:37m	Established	Up

This example sends both default route and AS#65002 routes from Switch2/3 to Switch4, it is also possible to filter out specific BGP routes and only send a default route as an alternative.

```
Switch4# show ipv6 route bgp
Displaying ipv6 routes selected for forwarding

'[x/y]' denotes [distance/metric]

::/0, vrf default
  via fe80::d067:2601:ce2:b6d2%1/1/12, [200/0], bgp
  via fe80::d067:2601:ce2:3670%1/1/11, [200/0], bgp
2001:db8:beef:98::/63, vrf default
  via fe80::d067:2601:ce2:b6d2%1/1/12, [200/0], bgp
  via fe80::d067:2601:ce2:3670%1/1/11, [200/0], bgp
```

Switch1a

Here are BGP related configs for Switch1a in AS#65002.

```
interface loopback 0
  ip address 192.168.50.11/32
! Lo0 IPv4 address was not required in previous sections, it is now required for BGP router ID
!
interface 1/1/5
  no shutdown
  description Switch2
  ipv6 address 2001:db8:beef:203::b/127
!
router bgp 65002
  neighbor 2001:db8:beef:1b::1 remote-as 65002
  neighbor 2001:db8:beef:1b::1 update-source loopback 0
  neighbor 2001:db8:beef:203::a remote-as 65001
  address-family ipv6 unicast
    neighbor 2001:db8:beef:1b::1 activate
    neighbor 2001:db8:beef:1b::1 next-hop-self
! Used to provide a valid next hop for peers
  neighbor 2001:db8:beef:203::a activate
  network 2001:db8:beef:98::/63
!
ipv6 route 2001:db8:beef:98::/63 blackhole
! Used to activate the BGP summary route
```

Here are relevant IBGP output after the other IBGP switches are configured.

```
Switch1a# show bgp ipv6 unicast summary
VRF : default
BGP Summary
-----
Local AS           : 65002           BGP Router Identifier : 192.168.50.11
Peers              : 2              Log Neighbor Changes  : No
Cfg. Hold Time    : 180           Cfg. Keep Alive       : 60

Neighbor          Remote-AS MsgRcvd MsgSent  Up/Down Time State      AdminStatus
```

```

2001:db8:beef:1b::1
    65002          1255      1259      18h:07m:40s  Established  Up
2001:db8:beef:203::a
    65001          1252      1252      18h:07m:40s  Established  Up

```

```

Switch1a# show ipv6 route bgp
Displaying ipv6 routes selected for forwarding

```

'[x/y]' denotes [distance/metric]

```

2001:db8:beef:101::/64, vrf default
    via 2001:db8:beef:203::a, [20/0], bgp
fd00:15:234:147::/64, vrf default
    via 2001:db8:beef:203::a, [20/0], bgp

```

Switch1b

Here are BGP related configs for Switch1b in AS#65002.

```

interface loopback 0
    ip address 192.168.50.12/32
! Lo0 IPv4 address was not required in previous sections, it is now required for BGP router ID
!
interface 1/1/8
    no shutdown
    description Switch3
    ipv6 address 2001:db8:beef:202::b/127
!
router bgp 65002
    neighbor 2001:db8:beef:1a::1 remote-as 65002
    neighbor 2001:db8:beef:1a::1 update-source loopback 0
    neighbor 2001:db8:beef:203::a remote-as 65001
    address-family ipv6 unicast
        neighbor 2001:db8:beef:1a::1 activate
        neighbor 2001:db8:beef:1a::1 next-hop-self
! Used to provide a valid next hop for peers
    neighbor 2001:db8:beef:203::a activate
    network 2001:db8:beef:98::/63
!
ipv6 route 2001:db8:beef:98::/63 blackhole
! Used to activate the BGP summary route

```

Here are relevant IBGP output after the other IBGP switches are configured.

```

Switch1b# show bgp ipv6 unicast summary
VRF : default
BGP Summary
-----

```

```

Local AS           : 65002           BGP Router Identifier : 192.168.50.12
Peers              : 2               Log Neighbor Changes  : No
Cfg. Hold Time    : 180             Cfg. Keep Alive       : 60

```

Neighbor	Remote-AS	MsgRcvd	MsgSent	Up/Down	Time	State	AdminStatus
2001:db8:beef:1a::1	65002	1279	1275	18h:24m:53s		Established	Up
2001:db8:beef:202::a	65001	1275	1280	18h:24m:51s		Established	Up

```
Switch1b# show ipv6 route bgp
Displaying ipv6 routes selected for forwarding
```

'[x/y]' denotes [distance/metric]

```
2001:db8:beef:101::/64, vrf default
    via 2001:db8:beef:202::a, [20/0], bgp
fd00:15:234:147::/64, vrf default
    via 2001:db8:beef:202::a, [20/0], bgp
```

VSX IPv6 Active Gateways

VSX IPv6 active gateways provide default gateway redundancy for clients, both primary and secondary VSX switches are able to forward traffic independently and simultaneously (unlike VRRP).

Here are IPv6 active gateway related configs for Switch1a in AS#65002.

```
interface vlan98
    ipv6 address 2001:db8:beef:98::2/64
! A unique IPv6 address is required on the L3 Switch Virtual Interface (SVI) for the VLAN
    active-gateway ipv6 mac 12:00:00:00:01:00
    active-gateway ipv6 2001:db8:beef:98::1
! The active gateway IPv6 and MAC for the same SVI on both switches should be the same
!
interface vlan99
    ipv6 address 2001:db8:beef:99::2/64
    active-gateway ipv6 mac 12:00:00:00:01:00
    active-gateway ipv6 2001:db8:beef:99::1
```

Here are IPv6 active gateway related configs for Switch1b in AS#65002.

```
interface vlan98
    ipv6 address 2001:db8:beef:98::3/64
! A unique IPv6 address is required on the L3 SVI for the VLAN
    active-gateway ipv6 mac 12:00:00:00:01:00
    active-gateway ipv6 2001:db8:beef:98::1
! The active gateway IPv6 and MAC for the same SVI on both switches should be the same
!
interface vlan99
    ipv6 address 2001:db8:beef:99::3/64
    active-gateway ipv6 mac 12:00:00:00:01:00
    active-gateway ipv6 2001:db8:beef:99::1
```


Client IPv6 address assignment using SLAAC and DHCPv6

The Router Advertisement (RA) sent by the L3 default gateway will guide client behavior with regards to IPv6 address assignment. However, final behavior is still dependent on the client OS, e.g. Android and ChromeOS do not support DHCPv6.

The chosen IPv6 address assignment method for each VLAN/subnet will depend on the expected client OS that connect to the network.

The table below provides a summary of expected IPv6 client behavior based on “Managed address configuration (M)”, “Other Configuration (O)” and “Autonomous address-configuration (A)” flag bit combinations in the Router Advertisement (RA) message.

Other Configuration (O) flag	Managed address configuration (M) flag	Autonomous address-configuration (A) flag	Expected Client Behavior
0	0	1	SLAAC = The IPv6 client uses the RA to derive addressing and DNS information (if configured)
1	0	1	Stateless DHCPv6 = The IPv6 client uses the RA to derive addressing and DHCPv6 to derive other information
0	1	0	Stateful DHCPv6 = The IPv6 client uses DHCPv6 to derive addressing and other information
1	1	0	When the M bit flag is set, the O flag is redundant and can be ignored as DHCPv6 will return all available information.

SLAAC

SLAAC allows a client to generate its own Global Unicast Address (GUA) using the RA sent by the L3 default gateway.

AOS-CX supports sending DNS Search List (DNSSL) and Recursive DNS Server (RDNSS) information together with SLAAC.

Here are SLAAC related configs for both Switch1a/1b in AS#65002, the IPv6 addresses were configured in a previous section. This config will set the M and O flags to 0/off, while leaving the A flag to 1/on.

```
interface vlan98
  no ipv6 nd suppress-ra dnssl
  no ipv6 nd suppress-ra rdNSS
! Allow RA, it is suppressed by default
  ipv6 nd ra dns search-list tmlab.internal
  ipv6 nd ra dns server fd00:15:234:147::195
! Send RDNSS and DNSSL information
```

Here is a packet capture of the RA.

```

8 12.827134    fe80::9020:c280:62b... ff02::1      ICMPv6      166 Router Advertisement from 90:20:c2:bb:41:00
> Frame 8: 166 bytes on wire (1328 bits), 166 bytes captured (1328 bits) on interface \Device\NPF_{E417155C-6750-4480-B8C6}
> Ethernet II, Src: ArubaaHe_bb:41:00 (90:20:c2:bb:41:00), Dst: IPv6mcast_01 (33:33:00:00:00:01)
> Internet Protocol Version 6, Src: fe80::9020:c280:62bb:4100, Dst: ff02::1
v Internet Control Message Protocol v6
  Type: Router Advertisement (134)
  Code: 0
  Checksum: 0x74a8 [correct]
  [Checksum Status: Good]
  Cur hop limit: 64
v Flags: 0x00, Prf (Default Router Preference): Medium
  0... .... = Managed address configuration: Not set
  .0... .... = Other configuration: Not set
  ..0. .... = Home Agent: Not set
  ...0 0... = Prf (Default Router Preference): Medium (0)
  .... .0.. = Proxy: Not set
  .... ..0. = Reserved: 0
  Router lifetime (s): 1800
  Reachable time (ms): 0
  Retrans timer (ms): 0
> ICMPv6 Option (Source link-layer address : 90:20:c2:bb:41:00)
> ICMPv6 Option (Recursive DNS Server fd00:15:234:147::195)
> ICMPv6 Option (DNS Search List Option tmlab.internal)
v ICMPv6 Option (Prefix information : 2001:db8:beef:98::/64)
  Type: Prefix information (3)
  Length: 4 (32 bytes)
  Prefix Length: 64
v Flag: 0xc0, On-link flag(L), Autonomous address-configuration flag(A)
  1... .... = On-link flag(L): Set
  .1.. .... = Autonomous address-configuration flag(A): Set
  ..0. .... = Router address flag(R): Not set
  ...0 0000 = Reserved: 0
  Valid Lifetime: 2592000

```

M and O flag set to 0/off

RDNSS and DNSSL information

A flag set to 1/on

Here is a screenshot of a Windows client with SLAAC and DNS resolution working as expected.

```
Command Prompt
C:\>ipconfig /all

Windows IP Configuration

Host Name . . . . . : DESKTOP-IQ7E831
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
DNS Suffix Search List. . . . . : tmelab.internal

Ethernet adapter Ethernet0:

Connection-specific DNS Suffix . : tmelab.internal
Description . . . . . : Intel(R) 82574L Gigabit Network Connection
Physical Address. . . . . : 00-50-56-8E-A6-95
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes
IPv6 Address. . . . . : 2001:db8:beef:98:c13b:3266:9102:8174(Preferred)
Temporary IPv6 Address. . . . . : 2001:db8:beef:98:eca2:153c:f636:b7a4(Preferred)
Link-local IPv6 Address . . . . . : fe80::c13b:3266:9102:8174%13(Preferred)
Default Gateway . . . . . : fe80::9020:c280:62bb:4100%13
                             fe80::9020:c280:62ba:c500%13
DHCPv6 IAID . . . . . : 100666409
DHCPv6 Client DUID. . . . . : 00-01-00-01-26-37-F6-16-00-50-56-8E-A6-95
DNS Servers . . . . . : fd00:15:234:147::195
                             fd00:15:234:147::195
NetBIOS over Tcpi. . . . . : Disabled
Connection-specific DNS Suffix Search List :
                             tmelab.internal
                             tmelab.internal

C:\>ping server1.tme.internal

Pinging server1.tme.internal [2001:db8:beef:101::11] with 32 bytes of data:
Reply from 2001:db8:beef:101::11: time<1ms
Reply from 2001:db8:beef:101::11: time<1ms
Reply from 2001:db8:beef:101::11: time<1ms
```

Stateless DHCPv6

Stateless DHCPv6 allows a client to use the RA to derive addressing and DHCPv6 to derive other information.

Here are Stateless DHCPv6 related configs for both Switch1a/1b in AS#65002, the IPv6 addresses were configured in a previous section. This config will set the M flag to 0/off and O and A flags to 1/on.

```
dhcpv6-relay
!
interface vlan99
  ipv6 nd ra other-config-flag
! Set O flag to 1/on
  no ipv6 nd suppress-ra
! Allow RA, it is suppressed by default
  ipv6 helper-address unicast fd00:15:234:147::195
! DHCPv6 relay to remote DHCPv6 server
```

Here is a packet capture of the RA.

```
5 4.604196 fe80::9020:c280:63b... ff02::1 ICMPv6 110 Router Advertisement from 90:20:c2:ba:c5:00
> Frame 5: 110 bytes on wire (880 bits), 110 bytes captured (880 bits) on interface \Device\NPF_{E417155C-6750-4480-B8C6-9...
> Ethernet II, Src: ArubaaHe_ba:c5:00 (90:20:c2:ba:c5:00), Dst: IPv6mcast_01 (33:33:00:00:00:01)
> Internet Protocol Version 6, Src: fe80::9020:c280:63ba:c500, Dst: ff02::1
v Internet Control Message Protocol v6
  Type: Router Advertisement (134)
  Code: 0
  Checksum: 0xa7cf [correct]
  [Checksum Status: Good]
  Cur hop limit: 64
  v Flags: 0x40, Other configuration, Prf (Default Router Preference): Medium
    0... .... = Managed address configuration: Not set
    .1.. .... = Other configuration: Set
    ..0. .... = Home Agent: Not set
    ...0 0... = Prf (Default Router Preference): Medium (0)
    .... .0.. = Proxy: Not set
    .... ..0. = Reserved: 0
  Router lifetime (s): 1800
  Reachable time (ms): 0
  Retrans timer (ms): 0
  > ICMPv6 Option (Source link-layer address : 90:20:c2:ba:c5:00)
  v ICMPv6 Option (Prefix information : 2001:db8:beef:99::/64)
    Type: Prefix information (3)
    Length: 4 (32 bytes)
    Prefix Length: 64
  v Flag: 0xc0, On-link flag(L), Autonomous address-configuration flag(A)
    1... .... = On-link flag(L): Set
    .1.. .... = Autonomous address-configuration flag(A): Set
    ..0. .... = Router address flag(R): Not set
    ...0 0000 = Reserved: 0
  Valid Lifetime: 2592000
```

M flag set to 0/off
O flag set to 1/on

A flag set to 1/on

Here is a screenshot of a Windows client with stateless DHCPv6 and DNS resolution working as expected.

```
Command Prompt
C:\>ipconfig /all

Windows IP Configuration

Host Name . . . . . : DESKTOP-IQ7E831
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Ethernet0:

Connection-specific DNS Suffix . . :
Description . . . . . : Intel(R) 82574L Gigabit Network Connection
Physical Address. . . . . : 00-50-56-8E-3F-CC
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes
IPv6 Address. . . . . : 2001:db8:beef:99:d979:a64c:628f:e47d(Preferred)
Temporary IPv6 Address. . . . . : 2001:db8:beef:99:9bc:e6e1:22d4:67bb(Preferred)
Link-local IPv6 Address . . . . . : fe80::d979:a64c:628f:e47d%13(Preferred)
Default Gateway . . . . . : fe80::9020:c280:63ba:c500%13
                             fe80::9020:c280:63bb:4100%13
DHCPv6 IAID . . . . . : 100666409
DHCPv6 Client DUID. . . . . : 00-01-00-01-26-42-C4-F4-00-50-56-8E-3F-CC
DNS Servers . . . . . : fd00:15:234:147::195
NetBIOS over Tcpi. . . . . : Disabled

C:\>ping server1.tme.internal

Pinging server1.tme.internal [2001:db8:beef:101::11] with 32 bytes of data:
Reply from 2001:db8:beef:101::11: time<1ms
Reply from 2001:db8:beef:101::11: time<1ms
Reply from 2001:db8:beef:101::11: time<1ms
Reply from 2001:db8:beef:101::11: time<1ms
```

Stateful DHCPv6

Stateful DHCPv6 allows a client to use DHCPv6 to derive addressing and other information.

Here are Stateful DHCPv6 related configs for both Switch1a/1b in AS65002, the IPv6 addresses were configured in a previous section. This config will set the M flag to 1/on and O and A flags to 0/off.

```
dhcpv6-relay
!
interface vlan99
  ipv6 nd prefix default valid 2592000 preferred 604800 no-autoconfig
! Set A flag to 0/off
  ipv6 nd ra managed-config-flag
! Set M flag to 1/on
  no ipv6 nd suppress-ra
! Allow RA, it is suppressed by default
  ipv6 helper-address unicast fd00:15:234:147::195
! DHCPv6 relay to remote DHCPv6 server
```

Here is a packet capture of the RA.

```
9 8.183672 fe80::9020:c280:63b... ff02::1 ICMPv6 110 Router Advertisement from 90:20:c2:bb:41:00
> Frame 9: 110 bytes on wire (880 bits), 110 bytes captured (880 bits) on interface \Device\NPF_{E417155C-6750-4480-B8C6-9
> Ethernet II, Src: ArubaaHe_bb:41:00 (90:20:c2:bb:41:00), Dst: IPv6mcast_01 (33:33:00:00:00:01)
> Internet Protocol Version 6, Src: fe80::9020:c280:63bb:4100, Dst: ff02::1
v Internet Control Message Protocol v6
  Type: Router Advertisement (134)
  Code: 0
  Checksum: 0xafce [correct]
  [Checksum Status: Good]
  Cur hop limit: 64
v Flags: 0x80, Managed address configuration, Prf (Default Router Preference): Medium
  1... .... = Managed address configuration: Set
  .0.. .... = Other configuration: Not set
  ..0. .... = Home Agent: Not set
  ...0 0... = Prf (Default Router Preference): Medium (0)
  .... .0.. = Proxy: Not set
  .... ..0. = Reserved: 0
  Router lifetime (s): 1800
  Reachable time (ms): 0
  Retrans timer (ms): 0
v ICMPv6 Option (Source link-layer address : 90:20:c2:bb:41:00)
  Type: Source link-layer address (1)
  Length: 1 (8 bytes)
  Link-layer address: ArubaaHe_bb:41:00 (90:20:c2:bb:41:00)
v ICMPv6 Option (Prefix information : 2001:db8:beef:99::/64)
  Type: Prefix information (3)
  Length: 4 (32 bytes)
  Prefix Length: 64
v Flag: 0x80, On-link flag(L)
  1... .... = On-link flag(L): Set
  .0.. .... = Autonomous address-configuration flag(A): Not set
  ..0. .... = Router address flag(R): Not set
  ...0 0000 = Reserved: 0
  Valid Lifetime: 2592000
  Preferred Lifetime: 604800
```

M flag set to 1/on
O flag set to 0/off

A flag set to 0/off

Here is a screenshot of a Windows client with stateful DHCP and DNS resolution working as expected.

```
Command Prompt
C:\>ipconfig /all

Windows IP Configuration

Host Name . . . . . : DESKTOP-IQ7E831
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Ethernet0:

Connection-specific DNS Suffix . . :
Description . . . . . : Intel(R) 82574L Gigabit Network Connection
Physical Address. . . . . : 00-50-56-8E-3F-CC
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes
IPv6 Address. . . . . : 2001:db8:beef:99:6ad0:9132:c59a:1c9d(Preferred)
Lease Obtained. . . . . : Wednesday, September 2, 2020 11:46:32 PM
Lease Expires . . . . . : Thursday, September 3, 2020 11:38:11 PM
Link-local IPv6 Address . . . . . : fe80::d979:a64c:628f:e47d%13(Preferred)
Default Gateway . . . . . : fe80::9020:c280:63bb:4100%13
                             fe80::9020:c280:63ba:c500%13
DHCPv6 IAID . . . . . : 100666409
DHCPv6 Client DUID. . . . . : 00-01-00-01-26-42-C4-F4-00-50-56-8E-3F-CC
DNS Servers . . . . . : fd00:15:234:147::195
NetBIOS over Tcpi. . . . . : Disabled

C:\>ping server1.tme.internal

Pinging server1.tme.internal [2001:db8:beef:101::11] with 32 bytes of data:
Reply from 2001:db8:beef:101::11: time<1ms
Reply from 2001:db8:beef:101::11: time<1ms
Reply from 2001:db8:beef:101::11: time<1ms
Reply from 2001:db8:beef:101::11: time<1ms
```

IPv6 Neighbor Discovery (ND) replaces IPv4 ARP for IP to MAC resolution, you can verify neighbors and IP/MAC bindings on your default gateway using

```
Switch1a# show ipv6 neighbors
```

IPv6 Address State	MAC	Port	Physical Port
2001:db8:beef:99:6ad0:9132:c59a:1c9d reachable	00:50:56:8e:3f:cc	vlan99	lag256
fe80::c13b:3266:9102:8174 reachable	00:50:56:8e:a6:95	vlan98	1/1/1
fe80::9020:c28f:a0bb:4100 reachable	90:20:c2:bb:41:00	vlan4000	lag256
2001:db8:beef:98:599b:b712:c261:d4e3 reachable	00:50:56:8e:a6:95	vlan98	1/1/1
2001:db8:beef:203::a reachable	d0:67:26:e2:b6:d2	1/1/5	1/1/5
fe80::d979:a64c:628f:e47d reachable	00:50:56:8e:3f:cc	vlan99	lag256
2001:db8:beef:98:eca2:153c:f636:b7a4 reachable	00:50:56:8e:a6:95	vlan98	1/1/1

Total Number Of IPv6 Neighbors Entries Listed- 7.

Appendix

Final configs for the switches used in this guide are provided below.

Final Switch1a configs

```

hostname Switch1a
user admin group administrators password ciphertext AQBap!snip
!
vrf KA
!
ssh server vrf mgmt
vlan 1
vlan 98-99
vlan 4000
interface mgmt
    no shutdown
    ip static 10.10.10.65/24
    default-gateway 10.10.10.254
system interface-group 1 speed 10g
    !interface group 1 contains ports 1/1/1-1/1/12
system interface-group 2 speed 10g
    !interface group 2 contains ports 1/1/13-1/1/24
system interface-group 3 speed 10g
    !interface group 3 contains ports 1/1/25-1/1/36
system interface-group 4 speed 10g
    !interface group 4 contains ports 1/1/37-1/1/48
interface lag 256
    no shutdown
    description ISL Link
    no routing
    vlan trunk native 1 tag
    vlan trunk allowed all
    lacp mode active
interface 1/1/1
    no shutdown
    no routing
    vlan access 98
interface 1/1/5
    no shutdown
    description Switch2
    ipv6 address 2001:db8:beef:203::b/127
interface 1/1/55
    no shutdown
    vrf attach KA
    description VSX Keepalive
    ip address 192.168.0.1/31
interface 1/1/56
    no shutdown
    mtu 9100
    description ISL Physical Link
    lag 256
interface loopback 0
    ip address 192.168.50.11/32
    ipv6 address 2001:db8:beef:1a::1/128

```

```

    ipv6 ripng 1
    exit
interface vlan 98
    description SLAAC
    ipv6 address 2001:db8:beef:98::2/64
    active-gateway ipv6 mac 12:00:00:00:01:00
    active-gateway ipv6 2001:db8:beef:98::1
    no ipv6 nd suppress-ra dnssl
    no ipv6 nd suppress-ra rdns
    ipv6 nd ra dns search-list tmlab.internal
    ipv6 nd ra dns server fd00:15:234:147::195
interface vlan 99
    description DHCPv6
    ipv6 address 2001:db8:beef:99::2/64
    active-gateway ipv6 mac 12:00:00:00:01:00
    active-gateway ipv6 2001:db8:beef:99::1
    ipv6 nd prefix default valid 2592000 preferred 604800 no-autoconfig
    ipv6 nd ra managed-config-flag
    no ipv6 nd suppress-ra
    ipv6 helper-address unicast fd00:15:234:147::195
interface vlan 4000
    description Transit
    ipv6 address 2001:db8:beef:4000::2/64
    ipv6 ripng 1
    exit
vsx
    system-mac 12:01:01:01:01:02
    inter-switch-link lag 256
    role secondary
    keepalive peer 192.168.0.0 source 192.168.0.1 vrf KA
ipv6 route 2001:db8:beef:98::/63 blackhole
dhcpv6-relay
!
!
!
!
!
router ripng 1
router bgp 65002
    neighbor 2001:db8:beef:1b::1 remote-as 65002
    neighbor 2001:db8:beef:1b::1 update-source loopback 0
    neighbor 2001:db8:beef:203::a remote-as 65001
    address-family ipv6 unicast
        neighbor 2001:db8:beef:1b::1 activate
        neighbor 2001:db8:beef:1b::1 next-hop-self
        neighbor 2001:db8:beef:203::a activate
        network 2001:db8:beef:98::/63
    exit-address-family
!
https-server vrf mgmt

```

Final Switch1b configs

```
hostname Switch1b
user admin group administrators password ciphertext AQBap!snip
!
vrf KA
!
!
!
ssh server vrf mgmt
vlan 1
vlan 98-99
vlan 4000
interface mgmt
    no shutdown
    ip static 10.10.10.66/24
    default-gateway 10.10.10.254
system interface-group 1 speed 10g
    !interface group 1 contains ports 1/1/1-1/1/12
system interface-group 2 speed 10g
    !interface group 2 contains ports 1/1/13-1/1/24
system interface-group 3 speed 10g
    !interface group 3 contains ports 1/1/25-1/1/36
system interface-group 4 speed 10g
    !interface group 4 contains ports 1/1/37-1/1/48
interface lag 256
    no shutdown
    description ISL Link
    no routing
    vlan trunk native 1 tag
    vlan trunk allowed all
    lacp mode active
interface 1/1/1
    no shutdown
    no routing
    vlan access 99
interface 1/1/8
    no shutdown
    description Switch3
    ipv6 address 2001:db8:beef:202::b/127
interface 1/1/55
    no shutdown
    vrf attach KA
    description VSX Keepalive
    ip address 192.168.0.0/31
interface 1/1/56
    no shutdown
    mtu 9100
    description ISL Physical Link
    lag 256
interface loopback 0
    ip address 192.168.50.12/32
    ipv6 address 2001:db8:beef:1b::1/128
    ipv6 ripng 1
```

```

        exit
interface vlan 98
  description SLAAC
  ipv6 address 2001:db8:beef:98::3/64
  active-gateway ipv6 mac 12:00:00:00:01:00
  active-gateway ipv6 2001:db8:beef:98::1
  no ipv6 nd suppress-ra dnssl
  no ipv6 nd suppress-ra rdns
  ipv6 nd ra dns search-list tmlab.internal
  ipv6 nd ra dns server fd00:15:234:147::195
interface vlan 99
  description DHCPv6
  ipv6 address 2001:db8:beef:99::3/64
  active-gateway ipv6 mac 12:00:00:00:01:00
  active-gateway ipv6 2001:db8:beef:99::1
  ipv6 nd prefix default valid 2592000 preferred 604800 no-autoconfig
  ipv6 nd ra managed-config-flag
  no ipv6 nd suppress-ra
  ipv6 helper-address unicast fd00:15:234:147::195
interface vlan 4000
  description Transit
  ipv6 address 2001:db8:beef:4000::1/64
  ipv6 ripng 1
  exit
vsx
  system-mac 12:01:01:01:01:02
  inter-switch-link lag 256
  role primary
  keepalive peer 192.168.0.1 source 192.168.0.0 vrf KA
  ipv6 route 2001:db8:beef:98::/63 blackhole
  dhcpv6-relay
  !
  !
  !
  !
  !
router ripng 1
router bgp 65002
  neighbor 2001:db8:beef:1a::1 remote-as 65002
  neighbor 2001:db8:beef:1a::1 update-source loopback 0
  neighbor 2001:db8:beef:202::a remote-as 65001
  address-family ipv6 unicast
    neighbor 2001:db8:beef:1a::1 activate
    neighbor 2001:db8:beef:1a::1 next-hop-self
    neighbor 2001:db8:beef:202::a activate
    network 2001:db8:beef:98::/63
  exit-address-family
!
https-server vrf mgmt

```

Final Switch2 configs

```

hostname Switch2
user admin group administrators password ciphertext AQBap!snip
!
ssh server vrf mgmt
!
!
vlan 1
interface mgmt
    no shutdown
    ip static 10.10.10.67/24
    default-gateway 10.10.10.254
interface 1/1/1
    no shutdown
    description Switch1a
    ipv6 address 2001:db8:beef:203::a/127
interface 1/1/3
    no shutdown
    description Switch4
    ipv6 address 2001:db8:beef:207::2/64
    ipv6 ospfv3 1 area 0.0.0.0
    ipv6 ospfv3 network point-to-point
interface loopback 0
    ip address 192.168.50.2/32
    ipv6 address 2001:db8:beef:2::1/128
    ipv6 ospfv3 1 area 0.0.0.0
ipv6 prefix-list accept65002 seq 10 permit 2001:db8:beef:98::/63
!
!
!
!
route-map accept65002 permit seq 10
    match ipv6 address prefix-list accept65002
!
router ospfv3 1
    router-id 192.168.50.2
    area 0.0.0.0
router bgp 65001
    neighbor 2001:db8:beef:203::b remote-as 65002
    neighbor 2001:db8:beef:3::1 remote-as 65001
    neighbor 2001:db8:beef:3::1 update-source loopback 0
    neighbor 2001:db8:beef:4::1 remote-as 65001
    neighbor 2001:db8:beef:4::1 update-source loopback 0
    address-family ipv6 unicast
        neighbor 2001:db8:beef:203::b activate
        neighbor 2001:db8:beef:203::b route-map accept65002 in
        neighbor 2001:db8:beef:3::1 activate
        neighbor 2001:db8:beef:3::1 next-hop-self
        neighbor 2001:db8:beef:4::1 activate
        neighbor 2001:db8:beef:4::1 default-originate
        neighbor 2001:db8:beef:4::1 next-hop-self
        network 2001:db8:beef:101::/64
        network fd00:15:234:147::/64

```

```

    exit-address-family
!
https-server vrf mgmt

```

Final Switch3 configs

```

hostname Switch3
user admin group administrators password ciphertext AQBap!snip
!
ssh server vrf mgmt
!
!
vlan 1
interface mgmt
    no shutdown
    ip static 10.10.10.68/24
    default-gateway 10.10.10.254
interface 1/1/3
    no shutdown
    description Switch4
    ipv6 address 2001:db8:beef:208::2/64
    ipv6 ospfv3 1 area 0.0.0.0
    ipv6 ospfv3 network point-to-point
interface 1/1/48
    no shutdown
    description Switch1b
    ipv6 address 2001:db8:beef:202::a/127
interface loopback 0
    ip address 192.168.50.3/32
    ipv6 address 2001:db8:beef:3::1/128
    ipv6 ospfv3 1 area 0.0.0.0
ipv6 prefix-list accept65002 seq 10 permit 2001:db8:beef:98::/63
!
!
!
!
route-map accept65002 permit seq 10
    match ipv6 address prefix-list accept65002
!
router ospfv3 1
    router-id 192.168.50.3
    area 0.0.0.0
router bgp 65001
    neighbor 2001:db8:beef:202::b remote-as 65002
    neighbor 2001:db8:beef:2::1 remote-as 65001
    neighbor 2001:db8:beef:2::1 update-source loopback 0
    neighbor 2001:db8:beef:4::1 remote-as 65001
    neighbor 2001:db8:beef:4::1 update-source loopback 0
    address-family ipv6 unicast
        neighbor 2001:db8:beef:202::b activate
        neighbor 2001:db8:beef:202::b route-map accept65002 in
        neighbor 2001:db8:beef:2::1 activate
        neighbor 2001:db8:beef:2::1 next-hop-self

```

```

    neighbor 2001:db8:beef:4::1 activate
    neighbor 2001:db8:beef:4::1 default-originate
    neighbor 2001:db8:beef:4::1 next-hop-self
    network 2001:db8:beef:101::/64
    network fd00:15:234:147::/64
  exit-address-family
!
https-server vrf mgmt

```

Final Switch4 configs

```

hostname Switch4
user admin group administrators password ciphertext AQBap!snip
!
ssh server vrf mgmt
!
!
vlan 1
vlan 101
interface mgmt
  no shutdown
  ip static 10.10.10.69/24
  default-gateway 10.10.10.254
interface 1/1/11
  no shutdown
  description Switch3
  ipv6 address 2001:db8:beef:208::1/64
  ipv6 ospfv3 1 area 0.0.0.0
  ipv6 ospfv3 network point-to-point
interface 1/1/12
  no shutdown
  description Switch2
  ipv6 address 2001:db8:beef:207::1/64
  ipv6 pim6-sparse enable
  ipv6 ospfv3 1 area 0.0.0.0
  ipv6 ospfv3 network point-to-point
interface 1/1/20
  no shutdown
  no routing
  vlan access 101
interface 1/1/47
  no shutdown
  ipv6 address fd00:15:234:147::3/64
  ipv6 ospfv3 1 area 0.0.0.0
interface loopback 0
  ip address 192.168.50.4/32
  ipv6 address 2001:db8:beef:4::1/128
  ipv6 ospfv3 1 area 0.0.0.0
interface vlan 101
  description Server
  ipv6 address 2001:db8:beef:101::1/64
  ipv6 ospfv3 1 area 0.0.0.0
  ipv6 ospfv3 passive

```

```
ip dns server-address fd00:15:234:147::195
!
!
!
!
!
router ospfv3 1
  router-id 192.168.50.4
  area 0.0.0.0
router bgp 65001
  neighbor 2001:db8:beef:2::1 remote-as 65001
  neighbor 2001:db8:beef:2::1 update-source loopback 0
  neighbor 2001:db8:beef:3::1 remote-as 65001
  neighbor 2001:db8:beef:3::1 update-source loopback 0
  address-family ipv6 unicast
    neighbor 2001:db8:beef:2::1 activate
    neighbor 2001:db8:beef:3::1 activate
  exit-address-family
!
https-server vrf mgmt
```

IPv6 Multicast

For IPv6 multicast, refer to [AOS-CX Multicast deployment and troubleshooting guide](#)

ND Snooping (RA Guard) and DHCPv6 snooping

For ND snooping (RA Guard) and DHCPv6 snooping on 6300/6400, refer to [6300/6400 IP Services Guide](#)

For DHCPv6 snooping on 8400, refer to [8400 IP Services Guide](#)

IPv6 Routing Protocols

For more details on the IPv6 routing protocols, refer to [IP Routing Guide](#)



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