

Routing  
Switching  
Tigers  
Forum



IPv6



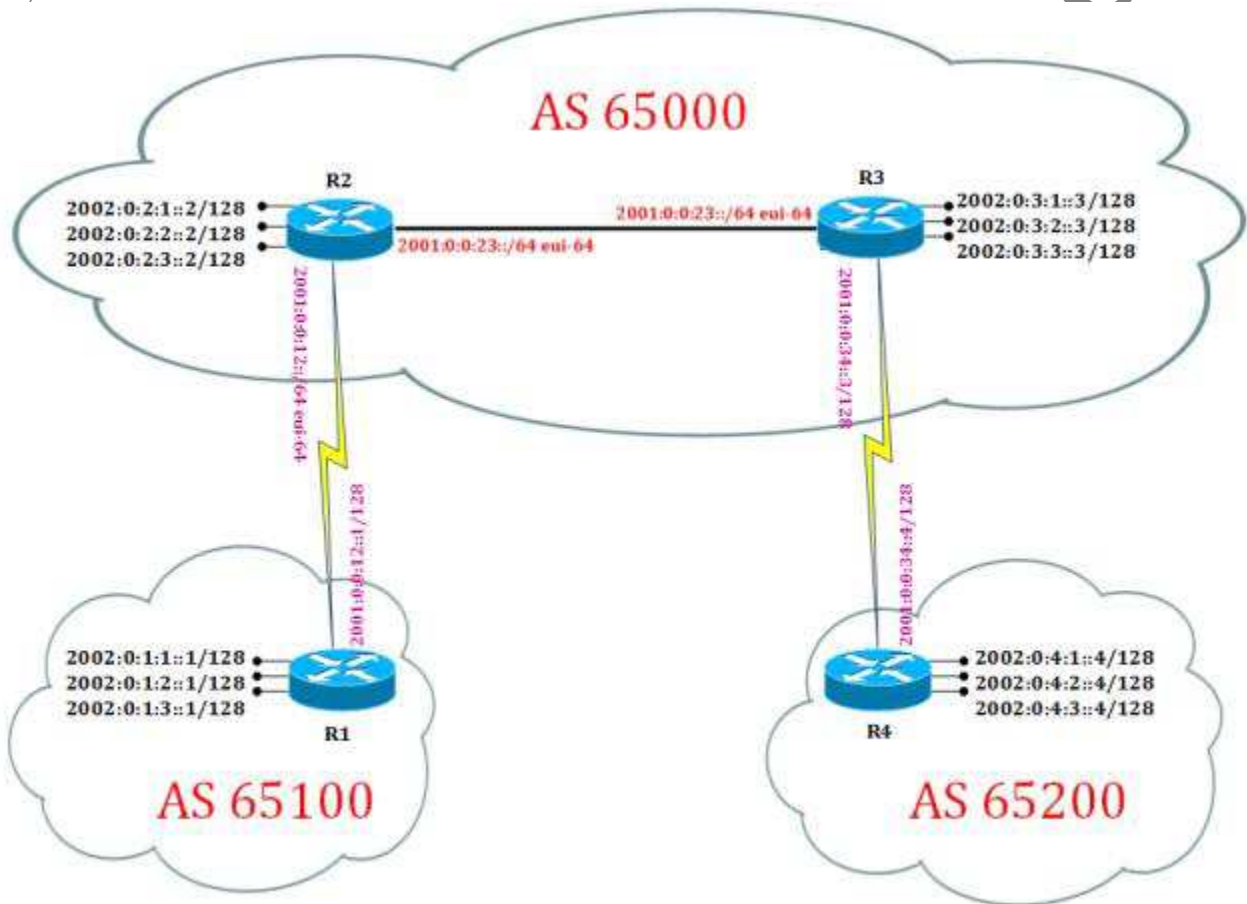
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# IPv6-BGP

## Disclaimer

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Cisco IOS Software, 7200 Software (C7200-ADVENTERPRISEK9-M), Version 15.0(1)M9, RELEASE SOFTWARE (fc1)



W

R1 Router Config:

```
!  
ipv6 unicast-routing  
!  
interface Loopback0  
no ip address  
ipv6 address 2002:0:1:1::1/128  
ipv6 ospf 1 area 0  
!  
interface Loopback1  
no ip address  
ipv6 address 2002:0:1:2::1/128  
ipv6 ospf 1 area 0  
!  
interface Loopback2  
no ip address  
ipv6 address 2002:0:1:3::1/128  
ipv6 ospf 1 area 0  
!  
interface Serial1/0  
no ip address  
ipv6 address 2001:0:0:12::1/128  
ipv6 ospf 1 area 0  
no fair-queue  
serial restart-delay 0  
!  
router bgp 65100  
bgp router-id 1.1.1.1  
no bgp default ipv4-unicast  
bgp log-neighbor-changes  
neighbor 2002:0:2:1::2 remote-as 65000  
neighbor 2002:0:2:1::2 ebgp-multihop 5  
neighbor 2002:0:2:1::2 update-source  
Loopbac0  
address-family ipv6  
network 2002:0:1:2::1/128  
network 2002:0:1:3::1/128  
neighbor 2002:0:2:1::2 activate  
exit-address-family  
!  
ipv6 router ospf 1  
router-id 1.1.1.1  
log-adjacency-changes
```

R4 Router Config:

```
!  
ipv6 unicast-routing  
!  
interface Loopback0  
no ip address  
ipv6 address 2002:0:4:1::4/128  
ipv6 ospf 1 area 0  
!  
interface Loopback1  
no ip address  
ipv6 address 2002:0:4:2::4/128  
ipv6 ospf 1 area 0  
!  
interface Loopback2  
no ip address  
ipv6 address 2002:0:4:3::4/128  
ipv6 ospf 1 area 0  
!  
interface Serial1/0  
no ip address  
ipv6 address 2001:0:0:34::4/128  
ipv6 ospf 1 area 0  
serial restart-delay 0  
clock rate 64000  
!  
router bgp 65200  
bgp router-id 4.4.4.4  
no bgp default ipv4-unicast  
bgp log-neighbor-changes  
neighbor 2002:0:3:1::3 remote-as 65000  
neighbor 2002:0:3:1::3 ebgp-multihop 5  
neighbor 2002:0:3:1::3 update-source  
Loopback0  
address-family ipv6  
network 2002:0:4:2::4/128  
network 2002:0:4:3::4/128  
neighbor 2002:0:3:1::3 activate  
exit-address-family  
!  
ipv6 router ospf 1  
router-id 4.4.4.4  
log-adjacency-changes
```

R2 Router Config:

```
!  
ipv6 unicast-routing  
!  
interface Loopback0  
no ip address  
ipv6 address 2002:0:2:1::2/128  
ipv6 ospf 1 area 0  
!  
interface Loopback1  
no ip address  
ipv6 address 2002:0:2:2::2/128  
ipv6 ospf 1 area 0  
!  
interface Loopback2  
no ip address  
ipv6 address 2002:0:2:3::2/128  
ipv6 ospf 1 area 0  
!  
interface Serial1/0  
no ip address  
ipv6 address 2001:0:0:12::/64 eui-64  
ipv6 ospf 1 area 0  
no fair-queue  
serial restart-delay 0  
clock rate 64000  
!  
interface FastEthernet2/0  
no ip address  
duplex full  
speed 100  
ipv6 address 2001:0:0:23::/64 eui-64  
ipv6 ospf 1 area 0  
!  
router bgp 65000  
bgp router-id 2.2.2.2  
no bgp default ipv4-unicast  
bgp log-neighbor-changes  
neighbor 2001::23:C803:6FF:FEAF:38  
remote-as 65000  
neighbor 2002:0:1:1::1 remote-as 65100  
neighbor 2002:0:1:1::1 ebgp-multihop 5  
neighbor 2002:0:1:1::1 update-source  
Loopback0
```

R3 Router Config:

```
!  
ipv6 unicast-routing  
!  
interface Loopback0  
no ip address  
ipv6 address 2002:0:3:1::3/128  
ipv6 ospf 1 area 0  
!  
interface Loopback1  
no ip address  
ipv6 address 2002:0:3:2::3/128  
ipv6 ospf 1 area 0  
!  
interface Loopback2  
no ip address  
ipv6 address 2002:0:3:3::3/128  
ipv6 ospf 1 area 0  
!  
interface Serial1/0  
no ip address  
ipv6 address 2001:0:0:34::3/128  
ipv6 ospf 1 area 0  
no fair-queue  
serial restart-delay 0  
clock rate 64000  
!  
interface FastEthernet2/0  
no ip address  
duplex auto  
speed auto  
ipv6 address 2001:0:0:23::/64 eui-64  
ipv6 ospf 1 area 0  
!  
router bgp 65000  
bgp router-id 3.3.3.3  
no bgp default ipv4-unicast  
bgp log-neighbor-changes  
neighbor 2001::23:C802:6FF:FEAF:38  
remote-as 65000  
neighbor 2002:0:4:1::4 remote-as 65200  
neighbor 2002:0:4:1::4 ebgp-multihop 5  
neighbor 2002:0:4:1::4 update-source  
Loopback0
```

```

address-family ipv6
network 2002:0:2:2::2/128
network 2002:0:2:3::2/128
neighbor 2001::23:C803:6FF:FEAF:38
activate
neighbor 2002:0:1:1::1 activate
exit-address-family
!
ipv6 router ospf 1
router-id 2.2.2.2
log-adjacency-changes
!

```

```

address-family ipv6
network 2002:0:3:2::3/128
network 2002:0:3:3::3/128
neighbor 2001::23:C802:6FF:FEAF:38
activate
neighbor 2002:0:4:1::4 activate
exit-address-family
!
ipv6 router ospf 1
router-id 3.3.3.3
log-adjacency-changes
!

```

**Note:** R1(config-router)#neighbor FE80::C802:6FF:FEAF:0 remote-as 65000  
 % BGP(v6): Invalid scope. Unable to configure link-local peer.  
 (In BGP Link local address can not be used by default for making BGP neighborship)

**Verification:**

**R1#sh bgp ipv6 unicast neighbors**

BGP neighbor is 2002:0:2:1::2, remote AS 65000, external link (IPv6 address of peer with which neighborship has been formed, AS no. to which neighbor belongs, whether link is in other AS or same AS [external link – eBGP neighbor, internal link – iBGP neighbor])

BGP version 4, remote router ID 2.2.2.2 (version of BGP, peer router ID)

Session state = Established, up for 00:06:22 (Neighborship state with peer [Established-neighborship successfully formed, Active-I am sending BGP hello waiting for peer response, Idle-I am trying to establish TCP connection with peer])

Last read 00:00:51, last write 00:00:10, hold time is 180, keepalive interval is 60 seconds (hold time=Dead Timer, keepalive interval=Hello Timer)

-----<output omitted>-----

**R2#sh bgp ipv6 unicast neighbors**

BGP neighbor is 2001::23:C803:6FF:FEAF:38, remote AS 65000, internal link

BGP version 4, remote router ID 3.3.3.3

Session state = Established, up for 00:05:10

Last read 00:00:46, last write 00:00:16, hold time is 180, keepalive interval is 60 seconds

-----<output omitted>-----

BGP neighbor is 2002:0:1:1::1, remote AS 65100, external link

BGP version 4, remote router ID 1.1.1.1

BGP state = Established, up for 00:02:31

Last read 00:00:46, last write 00:00:26, hold time is 180, keepalive interval is 60 seconds

-----<output omitted>-----

**R3#sh bgp ipv6 unicast neighbors**

BGP neighbor is 2001::23:C802:6FF:FEAF:38, remote AS 65000, internal link  
BGP version 4, remote router ID 2.2.2.2  
Session state = Established, up for 00:05:10  
Last read 00:00:16, last write 00:00:46, hold time is 180, keepalive interval is 60 seconds  
——<output omitted>——

BGP neighbor is 2002:0:4:1::4, remote AS 65200, external link  
BGP version 4, remote router ID 4.4.4.4  
BGP state = Established, up for 00:03:57  
Last read 00:00:24, last write 00:00:02, hold time is 180, keepalive interval is 60 seconds  
——<output omitted>——

**R4#sh bgp ipv6 unicast neighbors**

BGP neighbor is 2002:0:3:1::3, remote AS 65000, external link  
BGP version 4, remote router ID 3.3.3.3  
Session state = Established, up for 00:04:24  
Last read 00:00:43, last write 00:00:48, hold time is 180, keepalive interval is 60 seconds  
——<output omitted>——

**R1#sh bgp ipv6 unicast**

BGP table version is 9, local router ID is 1.1.1.1  
Status codes: s suppressed, d damped, h history, \* valid, > best, i – internal,  
r RIB-failure, S Stale

Origin codes: i – IGP, e – EGP, ? – incomplete

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 2002:0:1:2::1/128	::	0		32768	i
*> 2002:0:1:3::1/128	::	0		32768	i
*> 2002:0:2:2::2/128	2002:0:2:1::2	0		0	65000 i
*> 2002:0:2:3::2/128	2002:0:2:1::2	0		0	65000 i
*> 2002:0:3:2::3/128	2002:0:2:1::2	0		0	65000 i
*> 2002:0:3:3::3/128	2002:0:2:1::2	0		0	65000 i
*> 2002:0:4:2::4/128	2002:0:2:1::2	0		0	65000 65200 i
*> 2002:0:4:3::4/128	2002:0:2:1::2	0		0	65000 65200 i

(Network: Announced network on router or network received via BGP neighbor ; Next Hop: IPv6 address to which a packet received for this network should be forwarded ; Metic: MED attribue of BGP ; LocPrf: local preference attribute of BGP ; Weight: weight attribute of BGP ; Path: AS numbers from where the route has passed before coming to this router)

**R2#sh bgp ipv6 unicast**

BGP table version is 9, local router ID is 2.2.2.2  
Status codes: s suppressed, d damped, h history, \* valid, > best, i – internal,  
r RIB-failure, S Stale

Origin codes: i – IGP, e – EGP, ? – incomplete

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 2002:0:1:2::1/128	2002:0:1:1::1	0		0	65100 i
*> 2002:0:1:3::1/128	2002:0:1:1::1	0		0	65100 i
*> 2002:0:2:2::2/128	::	0		32768	i
*> 2002:0:2:3::2/128	::	0		32768	i
*>i2002:0:3:2::3/128	2001::23:C803:6FF:FEAF:38	0	100	0	i
*>i2002:0:3:3::3/128	2001::23:C803:6FF:FEAF:38	0	100	0	i
*>i2002:0:4:2::4/128	2002:0:4:1::4	0	100	0	65200 i
*>i2002:0:4:3::4/128	2002:0:4:1::4	0	100	0	65200 i

### R3#sh bgp ipv6 unicast

BGP table version is 9, local router ID is 3.3.3.3

Status codes: s suppressed, d damped, h history, \* valid, > best, i – internal,  
r RIB-failure, S Stale

Origin codes: i – IGP, e – EGP, ? – incomplete

Network	Next Hop	Metric	LocPrf	Weight	Path
*>i2002:0:1:2::1/128	2002:0:1:1::1	0	100	0	65100 i
*>i2002:0:1:3::1/128	2002:0:1:1::1	0	100	0	65100 i
*>i2002:0:2:2::2/128	2001::23:C802:6FF:FEAF:38	0	100	0	i
*>i2002:0:2:3::2/128	2001::23:C802:6FF:FEAF:38	0	100	0	i
*> 2002:0:3:2::3/128	::	0		32768	i
*> 2002:0:3:3::3/128	::	0		32768	i
*> 2002:0:4:2::4/128	2002:0:4:1::4	0		0	65200 i
*> 2002:0:4:3::4/128	2002:0:4:1::4	0		0	65200 i

### R4#sh bgp ipv6 unicast

BGP table version is 9, local router ID is 4.4.4.4

Status codes: s suppressed, d damped, h history, \* valid, > best, i – internal,  
r RIB-failure, S Stale

Origin codes: i – IGP, e – EGP, ? – incomplete

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 2002:0:1:2::1/128	2002:0:3:1::3	0		0	65000 65100 i
*> 2002:0:1:3::1/128	2002:0:3:1::3	0		0	65000 65100 i
*> 2002:0:2:2::2/128	2002:0:3:1::3	0		0	65000 i
*> 2002:0:2:3::2/128	2002:0:3:1::3	0		0	65000 i
*> 2002:0:3:2::3/128	2002:0:3:1::3	0		0	65000 i

```
*> 2002:0:3:3::3/128    2002:0:3:1::3      0          0          65000 i
*> 2002:0:4:2::4/128    ::                  0          32768     i
*> 2002:0:4:3::4/128    ::                  0          32768     i
```

### Verification of basic BGP Rules

#### ***e-BGP neighbors should be directly connected***

Changes on R1:

```
R1(config)#router bgp 65100
```

```
R1(config-router)#no neigh 2002:0:2:1::2 ebgp-multihop 5
```

(#neigh 2002:0:2:1::2 ebgp-multihop 5 increases TTL value for e-BGP by 5; By default TTL value in IP header for e-BGP is 1. So neighbors should be only one hop away or directly connected.)

#### **Verification:**

##### ***R1#sh bgp ipv6 unicast neigh***

BGP neighbor is 2002:0:2:1::2, remote AS 65000, external link

BGP version 4, remote router ID 0.0.0.0

BGP state = Idle

(Neighborhood stuck in Idle state i.e. TCP session can not be formed, there must be some error in my configurations)

##### ***R2#sh bgp ipv6 unicast neighbors***

BGP neighbor is 2001::23:C803:6FF:FEAF:38, remote AS 65000, internal link

BGP version 4, remote router ID 0.0.0.0

BGP state = Active

(Neighborhood stuck in Active state i.e. Link is up, sending BGP keepalives but none received from neighbor)

#### ***i-BGP neighbors need not to be directly connected***

Changes on R2:

```
R2(config)#router bgp 65000
```

```
R2(config-router)#no neighbor 2001::23:C803:6FF:FEAF:38 remote-as 65000
```

```
R2(config-router)#neighbor 2002:0:3:1::3 remote-as 65000
```

```
R2(config-router)#neighbor 2002:0:3:1::3 update-source Loopback0
```

```
R2(config-router)#address-family ipv6
```

```
R2(config-router-af)#neighbor 2002:0:3:1::3 activate
```

Changes on R3:

```
R3(config)#router bgp 65000
```

```
R3(config-router)#neighbor 2001::23:C802:6FF:FEAF:38 remote-as 65000
```

```
R3(config-router)#neighbor 2002:0:2:1::2 remote-as 65000
```

```
R3(config-router)#address-family ipv6
```

```
R3(config-router-af)#neighbor 2002:0:2:1::2 activate
```

#### **Verification:**

##### ***R2#sh bgp ipv6 unicast neighbors***

BGP neighbor is 2002:0:3:1::3, remote AS 65000, internal link

BGP version 4, remote router ID 3.3.3.3



BGP state = Established, up for 00:02:16

Last read 00:00:26, last write 00:00:21, hold time is 180, keepalive interval is 60 seconds

**R3#sh bgp ipv6 unicast neighbors**

BGP neighbor is 2002:0:2:1::2, remote AS 65000, internal link

BGP version 4, remote router ID 2.2.2.2

BGP state = Established, up for 00:01:09

Last read 00:00:11, last write 00:00:17, hold time is 180, keepalive interval is 60 seconds

(On router R3, even we do not need to tell which source to use, R3 just replies by source IP which has been addressed by R2 in its keepalive.)

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