Configure the IPv6 BGP Local Preference Feature

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Contents

Introduction

This document explains the IPv6 Border Gateway Protocol (BGP) Local−Preference feature. Local preference is an indication to the AS about which path has preference to exit the AS in order to reach a certain network. A path with higher local preference is preferred more. The default value of preference is 100.

Prerequisites

Requirements

Ensure that you meet these requirements before you attempt this configuration:

- Understanding of BGP routing protocol and its operation
- Understanding of IPv6 Addressing scheme

Components Used

The information in this document is tested on these software and hardware versions

- Cisco IOS Software Release 12.4, Advance IP Services Feature Set
- " Cisco 3700 Series Multiservice Access Routers

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

Background Information

In the example, Router R1, R2 and R3 are part of BGP Autonomous System number 123. R4 is part of Autonomous System 101 and R5 part of Autonomous System 100.

The three routers (R1, R2 and R3) are configured with OSPFv3 for IGP connectivity. IPv6 prefix of loop back interface Lo 0 (1111:111:111:A::/64 eui–64, 2222:222:222:A::/64 eui–64 And 3333:333:333:A::/64 eui–64) of all three routers is advertised in Area 0 of OSPFv3 routing protocol.

IBGP peering is formed between routers R1, R2 and R3 through learnt loopback prefixes. Router R1 and R4 are connected over a WAN link (serial connection) and forms EBGP peering. Similarly router R3 and R5 are forming EBGP peering over WAN link.

Router R4 and R5 inject the same IPv6 prefixes:

1. network BC01:BC1:10:A::/64
2. network BC02:BC1:11:A::/64
3. network BC03:BC1:12:A::/64

As the two Routers R4 and R5 inject the same IPv6 prefixes, the path selection is based on BGP well–known Attributes. In this example, Local Preference is chosen. The BGP Local Preference value of 500 is set for the prefix BC01:BC1:10:A::/64 on router R3 through route–map. This results in R3 as the exit point for this prefix and R1 the exit point for the remaining two prefixes.

Configure

The fast Ethernet interfaces (F0/0 And F0/1) of routers R1, R2 And R3 are IPv6 enabled with IPv6 address of format eui–64.

Network Diagram

This document uses this network setup:
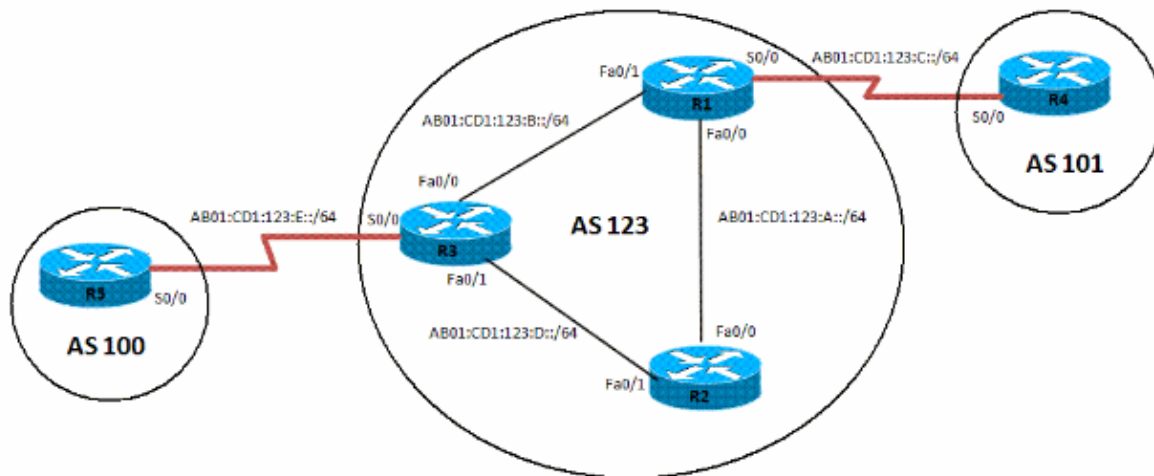
Configurations

This document uses these configurations:

- R1 Configuration
- R2 Configuration
- R3 Configuration
- R4 Configuration
- R5 Configuration

Note: All the routers are enabled with forwarding of IPv6 packets by using the **ipv6 unicast–routing** command .

R1

```
interface Loopback0
 no ip address
 ipv6 address 1111:111:111:A::/64 eui-64
 ipv6 enable
 ipv6 ospf 10 area 0

!--- Enables OSPFv3 on the interface and associates
!--- the interface loopback0 to area 0.

!
interface FastEthernet0/0
 description CONNECTED TO Rtr2
 no ip address
 duplex auto
 speed auto
 ipv6 address AB01:CD1:123:A::/64 eui-64
 ipv6 enable
 ipv6 ospf 10 area 0
!
interface Serial0/0
 no ip address
 ipv6 address AB01:CD1:123:C::/64 eui-64
 ipv6 enable
 clock rate 2000000
!
interface FastEthernet0/1
 no ip address
 duplex auto
 speed auto
 ipv6 address AB01:CD1:123:B::/64 eui-64
 ipv6 enable
 ipv6 ospf 10 area 0
!
ipv6 router ospf 10
 router-id 1.1.1.1
 log-adjacency-changes
 redistribute connected route-map CONNECTED
!
route-map CONNECTED permit 10
 match interface Serial0/0
!
router bgp 123
 bgp router-id 1.1.1.1
 no bgp default ipv4-unicast
 bgp log-neighbor-changes
 neighbor 2222:222:222:A:C602:3FF:FEF0:0 remote-as 123
 neighbor 2222:222:222:A:C602:3FF:FEF0:0 update-source Loopback0
 neighbor 3333:333:333:A:C603:3FF:FEF0:0 remote-as 123
 neighbor 3333:333:333:A:C603:3FF:FEF0:0 update-source Loopback0
 neighbor AB01:CD1:123:C:C604:16FF:FE98:0 remote-as 101
 neighbor AB01:CD1:123:C:C604:16FF:FE98:0 ebgp-multihop 5
 !
 address-family ipv6
  neighbor 2222:222:222:A:C602:3FF:FEF0:0 activate
  neighbor 2222:222:222:A:C602:3FF:FEF0:0 next-hop-self
  neighbor 3333:333:333:A:C603:3FF:FEF0:0 activate
  neighbor 3333:333:333:A:C603:3FF:FEF0:0 next-hop-self
  neighbor AB01:CD1:123:C:C604:16FF:FE98:0 activate
 exit-address-family
```

R2

```
interface Loopback0
 no ip address
 ipv6 address 2222:222:222:A::/64 eui-64
 ipv6 enable
 ipv6 ospf 10 area 0
!
interface FastEthernet0/0
 no ip address
 duplex auto
 speed auto
 ipv6 address AB01:CD1:123:A::/64 eui-64
 ipv6 ospf 10 area 0
!
interface FastEthernet0/1
 no ip address
 duplex auto
 speed auto
 ipv6 address AB01:CD1:123:D::/64 eui-64
 ipv6 enable
 ipv6 ospf 10 area 0
!
ipv6 router ospf 10
 router-id 2.2.2.2
 log-adjacency-changes
!
router bgp 123
 no synchronization
 bgp router-id 2.2.2.2
 bgp log-neighbor-changes
 neighbor 1111:111:111:A:C601:3FF:FEF0:0 remote-as 123
 neighbor 1111:111:111:A:C601:3FF:FEF0:0 update-source Loopback0
 neighbor 3333:333:333:A:C603:3FF:FEF0:0 remote-as 123
 neighbor 3333:333:333:A:C603:3FF:FEF0:0 update-source Loopback0
 no auto-summary
 !
 address-family ipv6
  neighbor 1111:111:111:A:C601:3FF:FEF0:0 activate
  neighbor 3333:333:333:A:C603:3FF:FEF0:0 activate
 exit-address-family
```

R3

```
interface Loopback0
 no ip address
 ipv6 address 3333:333:333:A::/64 eui-64
 ipv6 enable
 ipv6 ospf 10 area 0
!
interface FastEthernet0/0
 no ip address
 duplex auto
 speed auto
 ipv6 address AB01:CD1:123:B::/64 eui-64
 ipv6 enable
 ipv6 ospf 10 area 0
!
interface Serial0/0
 no ip address
 ipv6 address AB01:CD1:123:E::/64 eui-64
 ipv6 enable
 clock rate 2000000
!
interface FastEthernet0/1
```

```
 no ip address
 duplex auto
 speed auto
 ipv6 address AB01:CD1:123:D::/64 eui-64
 ipv6 ospf 10 area 0
!
ipv6 router ospf 10
 router-id 3.3.3.3
 log-adjacency-changes
 redistribute connected route-map CONNECTED
!
router bgp 123
 no synchronization
 bgp router-id 3.3.3.3
 bgp log-neighbor-changes
 neighbor 1111:111:111:A:C601:3FF:FEF0:0 remote-as 123
 neighbor 1111:111:111:A:C601:3FF:FEF0:0 update-source Loopback0
 neighbor 2222:222:222:A:C602:3FF:FEF0:0 remote-as 123
 neighbor 2222:222:222:A:C602:3FF:FEF0:0 update-source Loopback0
 neighbor AB01:CD1:123:E:C605:16FF:FE98:0 remote-as 202
 neighbor AB01:CD1:123:E:C605:16FF:FE98:0 ebgp-multihop 5
 no auto-summary
 !
 address-family ipv6
  neighbor 1111:111:111:A:C601:3FF:FEF0:0 activate
  neighbor 1111:111:111:A:C601:3FF:FEF0:0 next-hop-self
  neighbor 1111:111:111:A:C601:3FF:FEF0:0 route-map LOCAL_PREF out
  neighbor 2222:222:222:A:C602:3FF:FEF0:0 activate
  neighbor 2222:222:222:A:C602:3FF:FEF0:0 next-hop-self
  neighbor 2222:222:222:A:C602:3FF:FEF0:0 route-map LOCAL_PREF out
  neighbor AB01:CD1:123:E:C605:16FF:FE98:0 activate
 exit-address-family


!
ipv6 prefix-list 10 seq 5 permit BC01:BC1:10:A::/64
!
route-map LOCAL_PREF permit 10
 match ipv6 address prefix-list 10
 set local-preference 500
!
route-map LOCAL_PREF permit 20
!
route-map CONNECTED permit 10
 match interface Serial0/0
```

R4

```
interface Serial0/0
 no ip address
 ipv6 address AB01:CD1:123:C::/64 eui-64
 ipv6 enable
 clock rate 2000000
!
interface Loopback10
 no ip address
 ipv6 address BC01:BC1:10:A::/64 eui-64
 ipv6 enable
!
interface Loopback11
 no ip address
 ipv6 address BC02:BC1:11:A::/64 eui-64
 ipv6 enable
!
interface Loopback12
 no ip address
```

```
 ipv6 address BC03:BC1:12:A::/64 eui-64
 ipv6 enable

router bgp 101
 bgp router-id 4.4.4.4
 no bgp default ipv4-unicast
 bgp log-neighbor-changes
 neighbor AB01:CD1:123:C:C601:3FF:FEF0:0 remote-as 123
 neighbor AB01:CD1:123:C:C601:3FF:FEF0:0 ebgp-multihop 5
 !
 address-family ipv6
  neighbor AB01:CD1:123:C:C601:3FF:FEF0:0 activate
  network BC01:BC1:10:A::/64
  network BC02:BC1:11:A::/64
  network BC03:BC1:12:A::/64
 exit-address-family
```

R5

```
interface Serial0/0
 no ip address
 ipv6 address AB01:CD1:123:E::/64 eui-64
 ipv6 enable
 clock rate 2000000
!
interface Loopback10
 no ip address
 ipv6 address BC01:BC1:10:A::/64 eui-64
 ipv6 enable
!
interface Loopback11
 no ip address
 ipv6 address BC02:BC1:11:A::/64 eui-64
 ipv6 enable
!
interface Loopback12
 no ip address
 ipv6 address BC03:BC1:12:A::/64 eui-64
 ipv6 enable
!
router bgp 202
 bgp router-id 5.5.5.5
 no bgp default ipv4-unicast
 bgp log-neighbor-changes
 neighbor AB01:CD1:123:E:C603:3FF:FEF0:0 remote-as 123
 neighbor AB01:CD1:123:E:C603:3FF:FEF0:0 ebgp-multihop 5
 !
 address-family ipv6
  neighbor AB01:CD1:123:E:C603:3FF:FEF0:0 activate
  network BC01:BC1:10:A::/64
  network BC02:BC1:11:A::/64
  network BC03:BC1:12:A::/64
 exit-address-family
```

Verify

This section provides information you can use to confirm your configuration properly works.

On Router R1

1. **show ipv6 interface brief**

```
Rtr1#show ipv6 interface brief
FastEthernet0/0            [up/up]
    FE80::C601:3FF:FEF0:0
    AB01:CD1:123:A:C601:3FF:FEF0:0
Serial0/0                  [up/up]
    FE80::C601:3FF:FEF0:0
    AB01:CD1:123:C:C601:3FF:FEF0:0
FastEthernet0/1            [up/up]
    FE80::C601:3FF:FEF0:1
    AB01:CD1:123:B:C601:3FF:FEF0:1
Serial0/1                  [administratively down/down]
Loopback0                  [up/up]
    FE80::C601:3FF:FEF0:0
    1111:111:111:A:C601:3FF:FEF0:0
```

2. **show bgp ipv6 unicast summary**

```
Rtr1#show bgp ipv6 unicast summary
BGP router identifier 1.1.1.1, local AS number 123
BGP table version is 9, main routing table version 9
3 network entries using 456 bytes of memory
6 path entries using 456 bytes of memory
4/2 BGP path/bestpath attribute entries using 496 bytes of memory
2 BGP AS-PATH entries using 48 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
Bitfield cache entries: current 2 (at peak 2) using 64 bytes of memory
BGP using 1520 total bytes of memory
BGP activity 3/0 prefixes, 8/2 paths, scan interval 60 secs

Neighbor        V    AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
2222:222:222:A:C602:3FF:FEF0:0
                4   123      45      50        9    0    0 00:41:30            0
3333:333:333:A:C603:3FF:FEF0:0
                4   123      59      55        9    0    0 00:45:09            3
AB01:CD1:123:C:C604:16FF:FE98:0
                4   101      56      56        9    0    0 00:50:14            3
```

On Router R2

1. **show ipv6 interface brief**

```
Rtr2#show ipv6 interface brief
FastEthernet0/0            [up/up]
    FE80::C602:3FF:FEF0:0
    AB01:CD1:123:A:C602:3FF:FEF0:0
FastEthernet0/1            [up/up]
    FE80::C602:3FF:FEF0:1
    AB01:CD1:123:D:C602:3FF:FEF0:1
FastEthernet1/0            [administratively down/down]
Loopback0                  [up/up]
    FE80::C602:3FF:FEF0:0
    2222:222:222:A:C602:3FF:FEF0:0
```

2. **show bgp ipv6 unicast**

Note: When Local Preference is not configured, router R2 (Rtr2) has router R1 (Rtr1) as its next hop for all the learnt IPv6 addresses.

```
Rtr2#sh bgp ipv6 unicast
BGP table version is 4, 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
* iBC01:BC1:10:A::/64
                    3333:333:333:A:C603:3FF:FEF0:0
                                              0    100      0 202 i
*>i                 1111:111:111:A:C601:3FF:FEF0:0
                                              0    100      0 101 i
* iBC02:BC1:11:A::/64
                    3333:333:333:A:C603:3FF:FEF0:0
                                              0    100      0 202 i
*>i                 1111:111:111:A:C601:3FF:FEF0:0
                                              0    100      0 101 i
* iBC03:BC1:12:A::/64
                    3333:333:333:A:C603:3FF:FEF0:0
                                              0    100      0 202 i
*>i                 1111:111:111:A:C601:3FF:FEF0:0
                                              0    100      0 101 i
```

3. **show bgp ipv6 unicast**

After Configuring Local Preference 500 for the prefix BC01:BC1:10:A::/64, R2 has a different exit only for this prefix.

```
Rtr2#show bgp ipv6 unicast
BGP table version is 12, 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
*>iBC01:BC1:10:A::/64
                    3333:333:333:A:C603:3FF:FEF0:0
                                              0    500      0 202 i
*>iBC02:BC1:11:A::/64
                    1111:111:111:A:C601:3FF:FEF0:0
                                              0    100      0 101 i
* i                 3333:333:333:A:C603:3FF:FEF0:0
                                              0    100      0 202 i
*>iBC03:BC1:12:A::/64
                    1111:111:111:A:C601:3FF:FEF0:0
                                              0    100      0 101 i
* i                 3333:333:333:A:C603:3FF:FEF0:0
                                              0    100      0 202 i
```

Note: The prefix BC01:BC1:10:A::/64 takes an exit path of Router R3 as the Local Preference is set higher.

On Router R3

1. **show ipv6 interface brief**

```
Rtr3#show ipv6 interface brief
FastEthernet0/0            [up/up]
    FE80::C603:3FF:FEF0:0
    AB01:CD1:123:B:C603:3FF:FEF0:0
Serial0/0                  [up/up]
    FE80::C603:3FF:FEF0:0
    AB01:CD1:123:E:C603:3FF:FEF0:0
FastEthernet0/1            [up/up]
    FE80::C603:3FF:FEF0:1
    AB01:CD1:123:D:C603:3FF:FEF0:1
Serial0/1                  [administratively down/down]
    unassigned
Loopback0                  [up/up]
    FE80::C603:3FF:FEF0:0
    3333:333:333:A:C603:3FF:FEF0:0
```

2. **show bgp ipv6 unicast summary**

```
Rtr3#show bgp ipv6 unicast summary
BGP router identifier 3.3.3.3, local AS number 123
BGP table version is 4, main routing table version 4
3 network entries using 456 bytes of memory
5 path entries using 380 bytes of memory
3/1 BGP path/bestpath attribute entries using 372 bytes of memory
2 BGP AS-PATH entries using 48 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
Bitfield cache entries: current 1 (at peak 2) using 32 bytes of memory
BGP using 1288 total bytes of memory
BGP activity 3/0 prefixes, 8/3 paths, scan interval 60 secs

Neighbor        V    AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
1111:111:111:A:C601:3FF:FEF0:0
                4   123     57      61        4    0    0 00:47:59        2
2222:222:222:A:C602:3FF:FEF0:0
                4   123     51      63        4    0    0 00:44:59        0
AB01:CD1:123:E:C605:16FF:FE98:0
                4   202     55      53        4    0    0 00:49:40        3
```

Troubleshoot

Use these commands for troubleshooting

1. **debug bgp ipv6 updates**
2. **clear bgp ipv6 {unicast | multicast}**

Related Information

- **BGP Support Page**
- **BGP: Frequently Asked Questions**
- **BGP Best Path Selection Algorithm**
- **BGP Case Studies**
- **IP Version 6 Support Page**
- **Implementing Multiprotocol BGP for IPv6**
- **Technical Support & Documentation – Cisco Systems**