IPv6 BGP peering for EVPN AF

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IPv6 BGP peering for EVPN Address-Family

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3. Details / Caveats
4. Configuration
5. Best Practices
6. Troubleshooting
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Overview
Overview
IPv6 BGP peering for EVPN Address-Family

- EVPN address-family is hosted in the default VRF.
- Before 10.6, BGP peering for EVPN AF could be established only between IPv4 IP addresses.
- Since 10.6, IPv6 address can be used for BGP peers to exchange EVPN routes.
- This is valid for both iBGP and eBGP peering.
Use Cases
Use cases

- **Phase1 of IPV6 underlay** support for EVPN-based-VXLAN fabric
- **There is not yet any use-case for this feature in 10.6.** Reason: only IPv4 address is supported for VXLAN tunnel address.

When VXLAN IPv6 source address is available, then the use-case of a full IPv6 underlay for EVPN-VXLAN fabric will require such feature that is released as part of 10.6.

- Why is it in the scope of 10.6 then? This was a very small development effort to add this feature in 10.6, providing the necessary control-plane pre-requisite for IPv6 fabric underlay.

```
8325-1(config)# int vxlan 1
8325-1(config-vxlan-if)# source ip
   ip IP information
8325-1(config-vxlan-if)# source ip
   A.B.C.D  Set the tunnel source IP
```
## Platform Support

### 10.6

<table>
<thead>
<tr>
<th>Routing Protocols</th>
<th>6200</th>
<th>6300</th>
<th>6400</th>
<th>8360</th>
<th>8320</th>
<th>8325</th>
<th>8400</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPv6 MP-BGP peering EVPN AF</td>
<td>N/A</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IPv6 VXLAN interface</td>
<td>N/A</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
IPv6 BGP peering for EVPN AF - Details

- Dual-stack underlay BGP peering is not supported as not tested. IPv6 peer state might become “Connect” (verification pending):

```
8325-1# show bgp 12vpn evpn summary
VRF : default
BGP Summary
          ------
Local AS  : 65001        BGP Router Identifier  : 192.168.1.3
Peers    : 3            Log Neighbor Changes : Yes
Confederation Id : 0

Neighbor    Remote-AS  MsgRcvd  MsgSent  Up/Down Time  State  AdminStatus
192.168.1.1  65001      52       674     00h:01m:25s  Established  Up
fd00:192:168:1::1 65001      0        0     00h:00m:00s  Connect  Up
```
Configuration
IPv6 BGP peering configuration
Leaf/Spine iBGP example: OSPFv3 underlay

**Leaf**

```plaintext
interface 1/1/23
   no shutdown
   mtu 9198
   ipv6 address fd00:192:168:3::1/127
   ipv6 ospfv3 1 area 0.0.0.0
   no ipv6 ospfv3 passive
   ipv6 ospfv3 network point-to-point
   ipv6 ospfv3 authentication ipsec spi 256 sha1 ciphertext <snipped>
   !
   interface loopback 0
   ipv6 address fd00:192:168:1::3/128
   ipv6 ospfv3 1 area 0.0.0.0
   !
   router ospfv3 1
      router-id 192.168.1.3
      max-metric router-lsa include-stub on-startup 300
      passive-interface default
      area 0.0.0.0

leaf# show ipv6 route fd00:192:168:1::1/128
Displaying ipv6 routes selected for forwarding
'[/x/y]' denotes [distance/metric]
fd00:192:168:1::1/128, vrf default, tag 0
   via fe80::883a:3001:6493:ca40%1/1/23, [110/10], ospf
```

**Spine**

```plaintext
interface 1/1/25
   no shutdown
   mtu 9198
   ipv6 ospfu3 1 area 0.0.0.0
   no ipv6 ospfv3 passive
   ipv6 ospfv3 network point-to-point
   ipv6 ospfv3 authentication ipsec spi 256 sha1 ciphertext <snipped>
   !
   interface loopback 0
   ipv6 address fd00:192:168:1::1/128
   ipv6 ospfv3 1 area 0.0.0.0
   !
   router ospfv3 1
      router-id 192.168.1.1
      max-metric router-lsa include-stub on-startup 300
      passive-interface default
      area 0.0.0.0

spine# show ipv6 route fd00:192:168:1::3/128
Displaying ipv6 routes selected for forwarding
'[/x/y]' denotes [distance/metric]
fd00:192:168:1::3/128, vrf default, tag 0
   via fe80::5480:2801:5cfd:f300%1/1/25, [110/10], ospf
```
IPv6 BGP peering configuration

Leaf/Spine iBGP example: IPv6 BGP peering

### Leaf

```bash
router bgp 65001
  bgp router-id 192.168.1.3
  neighbor spine-RRv6 peer-group
  neighbor spine-Rv6 remote-as 65001
  neighbor spine-Rv6 description Spine and RR peer-group for IPv6
  neighbor spine-Rv6 password ciphertext <snipped>
  neighbor spine-Rv6 fall-over
  neighbor spine-Rv6 update-source loopback 0
  neighbor fd00:192:168:1::1 peer-group spine-RRv6
  address-family l2vpn evpn
  neighbor spine-Rv6 send-community extended
  neighbor fd00:192:168:1::1 activate
exit-address-family
```

```bash
leaf# show bgp l2vpn evpn summary
VRF : default
BGP Summary
---------
Local AS : 65001  BGP Router Identifier : 192.168.1.3
Peers : 4  Log Neighbor Changes : Yes
Confederation Id : 0
Neighbor Remote-AS MsgRcvd MsgSent Up/Down Time State AdminStatus
fd00:192:168:1::1  65001  49  30  00h:11m:37s Established Up
```

### Spine

```bash
router bgp 65001
  bgp router-id 192.168.1.1
  neighbor leafv6 peer-group
  neighbor leafv6 remote-as 65001
  neighbor leafv6 description Leaf RR Clients
  neighbor leafv6 password ciphertext <snipped>
  neighbor leafv6 fall-over
  neighbor leafv6 update-source loopback 0
  neighbor fd00:192:168:1::3 peer-group leafv6
  neighbor fd00:192:168:1::4 peer-group leafv6
  address-family l2vpn evpn
  neighbor spine-Rv6 send-community extended
  neighbor fd00:192:168:1::1 activate
exit-address-family
```

```bash
spine# show bgp l2vpn evpn summary
VRF : default
BGP Summary
---------
Local AS : 65001  BGP Router Identifier : 192.168.1.1
Peers : 6  Log Neighbor Changes : Yes
Confederation Id : 0
Neighbor Remote-AS MsgRcvd MsgSent Up/Down Time State AdminStatus
fd00:192:168:1::3  65001  32  54  00h:13m:47s Established Up
fd00:192:168:1::4  65001  30  62  00h:14m:13s Established Up
```
Best Practices
IPv6 BGP peering for EVPN AF - Best Practices

- iBGP peering with IPv6 GUA (or ULA).
- eBGP peering with IPv6 GUA/ULA or with LLA?
  - Currently (10.6), BGP peering with LLA is not permitted:
    - peering with GUA/ULA address is anyhow simpler. Next-hop IPv6 address will be accepted.
    - peering with LLA address seems simpler but is actually more complex:
      (example: it might require to specify the source interface and to apply a route-map to set a valid GUA next-hop)
- All well known recommendations for IPv4 neighboring apply as well for IPv6 case:
  - fall-over, password, description, ttl-security-hops…

```
8325-1(config-bgp)# neighbor fe80::883a:3001:6493:ca40 peer-group spine-RRv6
Invalid IPV4 or IPV6 address
```
Troubleshooting
# Troubleshooting

## Leaf/Spine iBGP example: show bgp commands

### Leaf

```plaintext
leaf# show bgp l2vpn evpn neighbors
Codes:  " Inherited from peer-group

VRF : default

<table>
<thead>
<tr>
<th>BGP Neighbor</th>
<th>Description</th>
<th>Peer-group</th>
</tr>
</thead>
<tbody>
<tr>
<td>fd00:192:168:1::1</td>
<td>Spine and RR peer-group for IPv6</td>
<td>spine-RRv6</td>
</tr>
<tr>
<td>192.168.1.1</td>
<td>Local</td>
<td>192.168.1.3</td>
</tr>
<tr>
<td>65001</td>
<td>Local AS</td>
<td>65001</td>
</tr>
<tr>
<td>192.168.1.3</td>
<td>Local Router Id</td>
<td>192.168.1.1</td>
</tr>
<tr>
<td>192.168.1.1</td>
<td>State</td>
<td>Established</td>
</tr>
<tr>
<td>192.168.1.1</td>
<td>Passive</td>
<td>No</td>
</tr>
<tr>
<td>180</td>
<td>Cfg. Hold Time</td>
<td>60</td>
</tr>
<tr>
<td>192.168.1.1</td>
<td>Neg. Hold Time</td>
<td>60</td>
</tr>
<tr>
<td>50h:40m:14s</td>
<td>Up/Down Time</td>
<td>Alt. Local-AS</td>
</tr>
<tr>
<td>No</td>
<td>Address Family</td>
<td>IPv6 Unicast</td>
</tr>
<tr>
<td>No</td>
<td>Address Family</td>
<td>IPv4 Unicast</td>
</tr>
<tr>
<td>Yes</td>
<td>Four Octet ASN</td>
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<td>Graceful Restart</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Route Refresh</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Receiver</td>
<td></td>
</tr>
<tr>
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<td>Graceful Restart Time</td>
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<td>Neg. Keep Alive</td>
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</tr>
<tr>
<td>179</td>
<td>Remote Port</td>
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</tr>
<tr>
<td>192.168.1.1</td>
<td>Remote Router Id</td>
<td></td>
</tr>
<tr>
<td>192.168.1.3</td>
<td>Remote Router Id</td>
<td></td>
</tr>
<tr>
<td>Leaf RR clients for IPv6</td>
<td>Peer Description</td>
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</tr>
<tr>
<td>0</td>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>Gr. Restart Time</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>Gr. Stalepath Time</td>
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<tr>
<td>255</td>
<td>TTL</td>
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</tr>
<tr>
<td>1</td>
<td>Last Send</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Last Rcvd</td>
<td></td>
</tr>
<tr>
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<td>Last SubErr Rcvd</td>
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</tr>
<tr>
<td>120</td>
<td>Graceful-Restart Time</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>Graceful-Restart Time</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td>Yes*</td>
<td>Peer Description</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Keepalive Time</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>
```

### Spine

```plaintext
spine# show bgp l2vpn evpn neighbors
Codes:  " Inherited from peer-group

VRF : default

<table>
<thead>
<tr>
<th>BGP Neighbor</th>
<th>Description</th>
<th>Peer-group</th>
</tr>
</thead>
<tbody>
<tr>
<td>fd00:192:168:1::1</td>
<td>Leaf RR clients for IPv6</td>
<td>spinev6</td>
</tr>
<tr>
<td>192.168.1.1</td>
<td>Local</td>
<td>192.168.1.1</td>
</tr>
<tr>
<td>65001</td>
<td>Local AS</td>
<td>65001</td>
</tr>
<tr>
<td>192.168.1.1</td>
<td>Remote Router Id</td>
<td>192.168.1.3</td>
</tr>
<tr>
<td>192.168.1.3</td>
<td>Local Router Id</td>
<td>192.168.1.1</td>
</tr>
<tr>
<td>192.168.1.1</td>
<td>State</td>
<td>Established</td>
</tr>
<tr>
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<td>Passive</td>
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</tr>
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<td>180</td>
<td>Cfg. Hold Time</td>
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<td>Neg. Hold Time</td>
<td>60</td>
</tr>
<tr>
<td>50h:40m:14s</td>
<td>Up/Down Time</td>
<td>Alt. Local-AS</td>
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<td>IPv6 Unicast</td>
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<tr>
<td>No</td>
<td>Address Family</td>
<td>IPv4 Unicast</td>
</tr>
<tr>
<td>Yes</td>
<td>Four Octet ASN</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Graceful Restart</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Route Refresh</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Receiver</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>Gr. Restart Time</td>
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<td>150</td>
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<td>0</td>
<td>Weight</td>
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</tr>
<tr>
<td>Yes*</td>
<td>Peer Description</td>
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<tr>
<td>66</td>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>
```
Troubleshooting

Leaf/Spine iBGP example: show bgp commands

Leaf

Leaf# show bgp 12vpn evpn

---

Network NextHop Metric LocPrf Weight Path

Route Distinguisher: 192.168.11.3:10 (L2VNI 10010)
** i [2]:[0]:[0]:[00:50:56:86:2d:79]:[10.1.10.11]:[fe80::250:56ff:fe8e:6191]
192.168.11.3 0 100 0 ?

-->

Route Distinguisher: 192.168.11.15 (L2VNI 10010)
** i [2]:[0]:[0]:[00:50:56:86:2d:79]:[10.1.10.11]:[fe80::250:56ff:fe8e:6191]
192.168.11.3 0 100 0 ?

---

Route Distinguisher: 192.168.11.310 (L2VNI 10010)
* [2][0][0]:[00:50:56:86:2d:79]:[fd00:192:168:1::3/128]
192.168.11.3 0 100 0 ?

<omitted output>

Spine

Spine# show bgp 12vpn evpn

---

Network NextHop Metric LocPrf Weight Path

Route Distinguisher: 192.168.11.3:10 (L2VNI 10010)
* [2][0][0]:[00:50:56:86:2d:79]:[10.1.10.11]:[fe80::250:56ff:fe8e:6191]
192.168.11.3 0 100 0 ?

<omitted output>
Thank you

swathi.shankar@hpe.com
vincent.giles@hpe.com