

### Ticket 07: BGP neighbor relationship issues between R4 and R2

A BGP neighbor relationship between R4 and R2 is not establishing. Please help!

#### Explanation:

Let's start on R4 side, we found R2 is trying to use ip 172.16.22.22 to form the BGP connection, but R4 does not have route 172.16.22.22 in the routing table:

```
R4#show ip bgp summary
BGP router identifier 172.16.4.4, local AS number 65500
BGP table version is 322429, main routing table version 322429
13 network entries using 1768 bytes of memory
14 path entries using 784 bytes of memory
3/3 BGP path/bestpath attribute entries using 384 bytes of memory
1 BGP rrinfo entries using 24 bytes of memory
2 BGP AS-PATH entries using 48 bytes of memory
1 BGP route-map cache entries using 36 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 3044 total bytes of memory
BGP activity 11494/11481 prefixes, 161221/161207 paths, scan interval 60 secs

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
10.150.20.254 4       64512  65536  97898   322429  0    0  6w3d    7
172.16.5.5    4       65500  65996  72620   322429  0    0  6w3d    1
172.16.6.6    4       65500 130475  72628   322429  0    0  6w3d    6
172.16.22.22 4       65502    0       0        1     0    0  never   Idle
R4#
```

```
R4#ping 172.16.22.22
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.22.22, timeout is 2 seconds:
....
Success rate is 0 percent (0/4)
```

```
R4#sh ip route 172.16.22.22
% Subnet not in table
R4#
```

```
R2#sh ip int brie
Interface      IP-Address      OK? Method Status      Protocol
GigabitEthernet0/0  172.16.26.2    YES NVRAM  up          up
GigabitEthernet0/1  172.16.28.2    YES NVRAM  up          up
Serial0/0/0        unassigned     YES NVRAM  administratively down down
Serial0/0/1        172.16.42.2    YES NVRAM  up          up
Loopback0         172.16.2.2     YES NVRAM  up          up
Loopback22        172.16.22.22   YES NVRAM  up          up
Loopback100       172.16.100.1   YES NVRAM  up          up
Loopback101       172.16.101.1   YES NVRAM  up          up
Loopback102       172.16.102.1   YES NVRAM  up          up
Loopback103       172.16.103.1   YES NVRAM  up          up
Tunnel0           172.16.42.2    YES unset  up          up
R2#
```

Then the problem is narrowed down to IGP now. Since R2 and R4 are both running OSPF as the IGP protocol, we can check the OSPF status between them:

```
R2#sh ip ospf int brie
Interface      PID   Area      IP Address/Mask  Cost  State Nbrs F/C
VLO            100   0         172.16.42.2/24   64    P2P   0/0
Lo0            100   2         172.16.2.2/24    1     P2P   0/0
Tu0            100   2         Unnumbered Se0/0/1 1000  P2P   0/0
Se0/0/1        100   2         172.16.42.2/24   64    P2P   1/1
Gi0/0          100   2         172.16.26.2/24   1     BDR   1/1
Lo22           100   5         172.16.22.22/24  1     LOOP  0/0
Gi0/1          100   5         172.16.28.2/24   1     DR    0/0
R2#
```

The loopback interface 22 which is used to form the BGP connection is in OSPF area 5, and the interface S0/0/1 which is used to connect R4 is in area 2, which means in order to let R4 get the information of Loopback 22 on R4, we have to build a virtual link between R4 and R2.

```
R2#sh ip ospf neighbor
Neighbor ID     Pri   State           Dead Time   Address         Interface
172.16.4.4      0     FULL/-          00:00:38   172.16.42.4    Serial0/0/1
172.16.6.6      1     FULL/DR         00:00:37   172.16.26.6    GigabitEthernet0/0
R2#
```

```
R2#show ip ospf virtual-links
Virtual Link OSPF_VL0 to router 172.16.4.4 is up
  Run as demand circuit
  DoNotAge LSA allowed.
  Transit area 2, via interface Serial0/0/1
Topology-MTID    Cost    Disabled    Shutdown    Topology Name
  0              64      no          no          Base
Transmit Delay is 1 sec, State POINT_TO_POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:03
Message digest authentication enabled
Youngest key id is 1
R2#
```

The virtual link between R4 and R2 is up, but we haven't seen a virtual link type neighbor in the results of "show ip ospf neighbor" on R2.

```
R2#sh ip ospf events
OSPF Router with ID (172.16.2.2) (Process ID 100)
1   *Jul 23 18:03:15.758: Bad pkt rcvd: 172.16.42.4 1
2   *Jul 23 18:03:06.430: Bad pkt rcvd: 172.16.42.4 1
3   *Jul 23 18:02:56.874: Bad pkt rcvd: 172.16.42.4 1
4   *Jul 23 18:02:47.218: Bad pkt rcvd: 172.16.42.4 1
5   *Jul 23 18:02:37.534: Bad pkt rcvd: 172.16.42.4 1
6   *Jul 23 18:02:28.330: Bad pkt rcvd: 172.16.42.4 1
```

```
R2#sh run | sec router ospf
router ospf 100
  router-id 172.16.2.2
  area 2 virtual-link 172.16.4.4 authentication message-digest
  area 2 virtual-link 172.16.4.4 message-digest-key 1 md5 TROUBLESHOOTING
  network 172.16.2.2 0.0.0.0 area 2
  network 172.16.22.22 0.0.0.0 area 5
  network 172.16.26.2 0.0.0.0 area 2
  network 172.16.28.2 0.0.0.0 area 5
  network 172.16.42.2 0.0.0.0 area 2
R2#
```

```
R4#sh run | sec router ospf
router ospf 100
  router-id 172.16.4.4
  area 2 virtual-link 172.16.2.2 authentication message-digest
  area 2 virtual-link 172.16.2.2 message-digest-key 1 md5 TROUBLESHOOTING
  redistribute connected subnets route-map CONN
  network 172.16.4.4 0.0.0.0 area 2
  network 172.16.34.4 0.0.0.0 area 0
  network 172.16.42.4 0.0.0.0 area 2
  neighbor 172.16.34.6
  neighbor 172.16.34.3
R4#
```

By staring at these two password for quite a long time, we finally found that they are not identical!! That's why the virtual link could be established but R4 and R2 cannot communicate due to authentication failure.

Note that R4 and R2 belong to different AS and they are using loopback interfaces to form the BGP connection, make sure both side have ebgp-multihop configured.

```
R4#sh run | sec router bgp
router bgp 65500
  bgp router-id 172.16.4.4
  bgp log-neighbor-changes
  neighbor 10.150.20.254 remote-as 64512
  neighbor 10.150.20.254 filter-list 1 in
  neighbor 172.16.5.5 remote-as 65500
  neighbor 172.16.5.5 update-source Loopback0
  neighbor 172.16.5.5 send-community
  neighbor 172.16.5.5 route-map BB2 out
  neighbor 172.16.6.6 remote-as 65500
  neighbor 172.16.6.6 update-source Loopback0
  neighbor 172.16.6.6 send-community
  neighbor 172.16.22.22 remote-as 65502
  neighbor 172.16.22.22 update-source Loopback0
```

```
R2#sh run | sec router bgp
router bgp 65502
  bgp router-id 172.16.2.2
  bgp log-neighbor-changes
  network 172.16.2.0 mask 255.255.255.0
  network 172.16.100.0 mask 255.255.255.0
  network 172.16.101.0 mask 255.255.255.0
  network 172.16.102.0 mask 255.255.255.0
  network 172.16.103.0 mask 255.255.255.0
  neighbor 172.16.4.4 remote-as 65500
  neighbor 172.16.4.4 ebgp-multihop 255
  neighbor 172.16.4.4 update-source Loopback22
  neighbor 172.16.6.6 remote-as 65500
  neighbor 172.16.6.6 ebgp-multihop 255
  neighbor 172.16.6.6 update-source Loopback0
R2#
```

**Solution:**

R2:       router ospf 100  
          area 2 virtual-link 172.16.4.4 me 1 md5 TROUBLESHOOTING

R4:       router bgp 65500  
          neighbor 172.16.2.2 ebgp 255