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1. Verification of the issue

→ we tried pinging 2.2.2.2 from all devices and each one failed

```
R1#ping 2.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R1#
```

```
R3#ping 2.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R3#
```

```
DLS1#ping 2.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
U.U.U
Success rate is 0 percent (0/5)
```

```
DLS2#ping 2.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
U.U.U
Success rate is 0 percent (0/5)
```

```
ALS1#ping 2.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
U.U.U
Success rate is 0 percent (0/5)
```

2. Troubleshooting method used

→ We will be using path/bottom-up routing approach. Starting from connectivity between R1, R2, and R3 at Layer 3. Verifying IGP reachability and direct connections. Checking BGP neighbor status and attributes. AS numbers, neighbor IPs, and next-hop values.

3. Steps taken to find the issue(s)

1. eBGP not forming with R2

→ R2 eBGP peers are not showing up (not established)

```
R1#show ip bgp summary
BGP router identifier 192.168.1.1, local AS number 65501
BGP table version is 2, main routing table version 2
1 network entries using 248 bytes of memory
1 path entries using 136 bytes of memory
1/1 BGP path/bestpath attribute entries using 288 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
BGP using 672 total bytes of memory
BGP activity 1/0 prefixes, 1/0 paths, scan interval 60 secs
1 networks peaked at 14:12:58 Nov 20 2025 EST (00:15:46.305 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
192.168.2.1     4        65502       0       0        1    0    0 never    Idle
192.168.3.1     4        65501       0       0        1    0    0 never    Idle

R1#
```

```
R3#show ip bgp summary
BGP router identifier 192.168.3.1, local AS number 65501
BGP table version is 2, main routing table version 2
1 network entries using 248 bytes of memory
1 path entries using 136 bytes of memory
1/1 BGP path/bestpath attribute entries using 288 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
BGP using 672 total bytes of memory
BGP activity 1/0 prefixes, 1/0 paths, scan interval 60 secs
1 networks peaked at 14:14:38 Nov 20 2025 EST (00:16:27.713 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
192.168.1.1     4        65501       0       0        1    0    0 never    Idle
192.168.2.1     4        65502       0       0        1    0    0 never    Idle

R3#
```

```
R1#show ip bgp
BGP table version is 2, local router ID is 192.168.1.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>   10.0.0.0         0.0.0.0                  0         32768 i
R1#config t
```

```
R3#show ip bgp
BGP table version is 2, local router ID is 192.168.3.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>   10.0.0.0         0.0.0.0                  0         32768 i
R3#config t
```

```
R2#show ip bgp
BGP table version is 3, local router ID is 192.168.2.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>   0.0.0.0          0.0.0.0                  0         32768 i
 *>   2.2.2.2/32       0.0.0.0                  0         32768 i
```

2. Direct connection problem between R1 and R3

```
R3#show ip int br
Any interface listed with OK? value "NO" does not have a valid configuration

Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0/0   209.165.200.221 YES TFTP   up                    up
GigabitEthernet0/0/1   unassigned      YES unset  up                    up
Gi0/0/1.99             10.1.99.3       YES TFTP   up                    up
Gi0/0/1.100            10.1.100.3      YES TFTP   up                    up
Gi0/0/1.110            10.1.110.3      YES TFTP   up                    up
Gi0/0/1.120            10.1.120.3      YES TFTP   up                    up
Gi0/0/1.200            10.1.200.3      YES TFTP   up                    up
Gi0/0/1.666            unassigned      YES unset  up                    up
GigabitEthernet0/0/2   unassigned      YES unset  down                  down
Serial0/1/0            unassigned      NO  unset  up                    down
Serial0/1/1            unassigned      NO  unset  up                    down
GigabitEthernet0       unassigned      YES TFTP   administratively down down
Loopback0              192.168.3.1     YES TFTP   up                    up
R3#
```

```
R1#ping 192.168.3.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.3.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R1#
```

```
R3#ping 192.168.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

```
R1#show ip eigrp neighbors
EIGRP-IPv4 VR(HQ) Address-Family Neighbors for AS(1)
H   Address                 Interface              Hold Uptime   SRTT   RTO  Q  Seq
                                                   (sec)         (ms)       Cnt Num
14  10.1.200.3              Gi0/0/1.200             14 01:04:26    7   100  0  27
13  10.1.120.3              Gi0/0/1.120             11 01:04:26    6   100  0  28
12  10.1.110.3              Gi0/0/1.110             12 01:04:26    6   100  0  21
11  10.1.100.3              Gi0/0/1.100             14 01:04:26    9   100  0  31
10  10.1.99.3               Gi0/0/1.99              14 01:04:26    9   100  0  19
9   10.1.200.252            Gi0/0/1.200             12 01:05:36    2   100  0  30
8   10.1.200.253            Gi0/0/1.200             14 01:05:36    1  4500  0  27
7   10.1.100.252            Gi0/0/1.100             13 01:05:37    1   100  0  25
6   10.1.100.253            Gi0/0/1.100             13 01:05:37    1  4500  0  26
5   10.1.120.253            Gi0/0/1.120             14 01:05:58    5   100  0  28
4   10.1.110.253            Gi0/0/1.110             14 01:05:58    5   100  0  29
3   10.1.120.252            Gi0/0/1.120             14 01:05:58    4   100  0  27
2   10.1.110.252            Gi0/0/1.110             14 01:05:58    4   100  0  28
1   10.1.99.252             Gi0/0/1.99              13 01:05:58    3   100  0  29
0   10.1.99.253             Gi0/0/1.99              12 01:05:58    5   100  0  30
EIGRP-IPv4 Neighbors for AS(65501)
R1#show ip route eigrp
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, m - OMP
       n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       H - NHRP, G - NHRP registered, g - NHRP registration summary
       o - ODR, P - periodic downloaded static route, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

R1#
```

```
R3#show ip eigrp neighbors
EIGRP-IPv4 VR(HQ) Address-Family Neighbors for AS(1)
H   Address                 Interface              Hold Uptime   SRTT   RTO  Q  Seq
                                                   (sec)         (ms)       Cnt Num
14  10.1.200.1              Gi0/0/1.200             13 01:05:17    2   100  0  28
13  10.1.120.1              Gi0/0/1.120             12 01:05:17    2   100  0  30
12  10.1.110.1              Gi0/0/1.110             13 01:05:17    4   100  0  27
11  10.1.100.1              Gi0/0/1.100             11 01:05:17    1   100  0  29
10  10.1.200.253            Gi0/0/1.200             10 01:05:17    4   100  0  39
9   10.1.120.253            Gi0/0/1.120             13 01:05:17    2   100  0  40
8   10.1.110.253            Gi0/0/1.110             10 01:05:17    4   100  0  38
7   10.1.200.252            Gi0/0/1.200             13 01:05:17    6   100  0  39
6   10.1.120.252            Gi0/0/1.120             14 01:05:17    6   100  0  37
5   10.1.110.252            Gi0/0/1.110             13 01:05:17    5   100  0  36
4   10.1.100.252            Gi0/0/1.100             13 01:05:17    1   100  0  40
3   10.1.99.252             Gi0/0/1.99              14 01:05:17    4   100  0  38
2   10.1.99.1               Gi0/0/1.99              10 01:05:17    6   100  0  26
1   10.1.99.253             Gi0/0/1.99              12 01:05:17    6   100  0  37
0   10.1.100.253            Gi0/0/1.100             13 01:05:17    4   100  0  36
EIGRP-IPv4 Neighbors for AS(65501)
R3#show ip route eigrp
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, m - OMP
       n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       H - NHRP, G - NHRP registered, g - NHRP registration summary
       o - ODR, P - periodic downloaded static route, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

R3#
```

→ both R1 and R3 have no routes

3. Incorrect BGP next-hop from R2 seen on

4. Description of the issue

1. eBGP neighbor misconfiguration - the eBGP neighbor statements on R1 and R3 did not correctly match the ISP edge router's address 192.168.2.1. eBGP peering to R2 could not establish on either R1 or R3.
2. The loopback networks 192.168.1.1/32 and 192.168.3.1/32 were not being advertised in EIGRP. R1 and R3 therefore had no routes to each other's loopbacks, so the iBGP session between them could not form.
3. Incorrect BGP next-hop handling on iBGP - R1 and R3 passed external routes learned from R2 to each other without changing the next-hop, so the next-hop remained 192.168.2.1. When one eBGP link failed, the other router could not use the iBGP path as a backup because the next-hop still pointed at 192.168.2.1 instead of the surviving router. This broke the failover requirement that both routers must still reach 2.2.2.2 regardless of which eBGP link is down.

5. Commands entered to fix the issue

1. eBGP not forming with R2

Commands entered on R1:
→ router bgp 65501
→ neighbor 192.168.2.1 remote-as 65502
→ neighbor 192.168.2.1 update-source loopback0
→ neighbor 192.168.3.1 next-hop self
→ end
→ clear ip bgp * soft

```
R1(config)#router bgp 65501
R1(config-router)#
*Nov 20 20:22:22.792: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:router bgp 65501
R1(config-router)#neighbor 192.168.2.1 remote-as 65502
R1(config-router)#ne
*Nov 20 20:22:41.111: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:neighbor 192.168.2.1 remote-as 655
02
R1(config-router)#neighbor 192.168.2.1 update-source loopback0
R1(config-router)#
*Nov 20 20:23:11.226: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:neighbor 192.168.2.1 update-source
 Loopback0
R1(config-router)#end
R1#
R1#
R1#con
*Nov 20 20:23:16.001: %SYS-5-CONFIG_I: Configured from console by console
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#exit
R1#
*Nov 20 20:23:22.034: %SYS-5-CONFIG_I: Configured from console by console
R1#clear ip bgp * soft
R1#
```

Commands entered on R3:
→ router bgp 65501
→ neighbor 192.168.2.1 remote-as 65502

→ neighbor 192.168.2.1 update-source loopback0
→ neighbor 192.168.1.1 next-hop self
→ end
→ clear ip bgp * soft

```
R3(config)#router bgp 65501
R3(config-router)#
*Nov 20 20:23:52.735: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:router bgp 65501
R3(config-router)#neigbor 192.168.2.1 remote-as 65502
                  ^
% Invalid input detected at '^' marker.

R3(config-router)#neighbor 192.168.2.1 remote-as 65502
R3(config-router)#nei
*Nov 20 20:24:15.814: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:neighbor 192.168.2.1 remote-as 655
02
R3(config-router)#neighbor 192.168.2.1 update-source loopback0
R3(config-router)#exit
R3(config)#
*Nov 20 20:24:33.120: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:neighbor 192.168.2.1 update-source
 Loopback0
R3(config)#
*Nov 20 20:24:34.447: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:exit
R3(config)#clear ip bgp * soft
           ^
% Invalid input detected at '^' marker.

R3(config)#end
R3#
*Nov 20 20:24:55.416: %SYS-5-CONFIG_I: Configured from console by console
R3#clear ip bgp * soft
R3#
```

Commands entered on R1:
→ router bgp 65501
→ network 192.168.1.1 mask 255.255.255.255

```
R1(config)#router bgp 65501
R1(config-router)#
*Nov 20 21:07:20.273: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:router bgp 65501
R1(config-router)#network 192.168.1.1 mask 255.255.255.255
R1(config-router)#end
```

Commands entered on R3:
→router bgp 65501
→ network 192.169.3.1 mask 255.255.255.255

```
R3(config)#router bgp 65501
R3(config-router)#net
*Nov 20 21:08:08.303: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:router bgp 65501
R3(config-router)#network 192.168.3.1 mask 255.255.255.255
R3(config-router)#end
```

2. Direct connection between R1 AND R3

Commands entered on R1:
→router eigrp 65501
→ network 192.168.1.1 0.0.0.0
→ passive-interface loopback0

```
R1(config)#router eigrp 65501
R1(config-router)#net
*Nov 20 20:27:01.840: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:router eigrp 65501
R1(config-router)#network 192.168.1.1 0.0.0.0
R1(config-router)#
*Nov 20 20:27:29.489: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:network 192.168.1.1 0.0.0.0
R1(config-router)#passive-interface loopback0
R1(config-router)#
*Nov 20 20:27:38.257: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:passive-interface Loopback0
R1(config-router)#end
```

Commands entered on R3:

→ router eigrp 65501

→ network 192.168.3.1 0.0.0.0

→ passive-interface loopback0

```
R3(config)#router eigrp 65501
R3(config-router)#
*Nov 20 20:28:01.428: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:router eigrp 65501
R3(config-router)#network 192.168.3.1 0.0.0.0
R3(config-router)#
*Nov 20 20:28:19.365: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:network 192.168.3.1 0.0.0.0
R3(config-router)#passive-interface loopback0
R3(config-router)#end
```

Commands entered on R1:

→ router bgp 65501

→ neighbor 192.168.2.1 disable-connected-check

```
R1(config)#router bgp 65501
R1(config-router)#
*Nov 20 21:16:28.778: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:router bgp 65501
R1(config-router)#neighbor 192.168.2.1 disable-connected-check
R1(config-router)#
```

Commands entered on R3:

→ router bgp 65501

→ neighbor 192.168.2.1 disable-connected-check

```
R3(config)#router bgp 65501
R3(config-router)#
*Nov 20 21:18:06.755: %PARSER-5-CFGLOG_LOGGEDCMD: User:console  logged command:router bgp 65501
R3(config-router)#neighbor 192.168.2.1 disable-connected-check
```

6. Verification the issue is resolved

1. eBGP not forming with R2

```
R1#show ip bgp
BGP table version is 5, local router ID is 192.168.1.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>   10.0.0.0         0.0.0.0                  0         32768 i
 *>   192.168.1.1/32   0.0.0.0                  0         32768 i
```

```
R3#show ip bgp
BGP table version is 5, local router ID is 192.168.3.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>   10.0.0.0         0.0.0.0                  0         32768 i
 *>   192.168.3.1/32   0.0.0.0                  0         32768 i
```

2. Direct connection between R1 AND R3

```
R1#show ip bgp summary
BGP router identifier 192.168.1.1, local AS number 65501
BGP table version is 5, main routing table version 5
2 network entries using 496 bytes of memory
2 path entries using 272 bytes of memory
1/1 BGP path/bestpath attribute entries using 288 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
BGP using 1056 total bytes of memory
BGP activity 2/0 prefixes, 2/0 paths, scan interval 60 secs
2 networks peaked at 16:07:36 Nov 20 2025 EST (00:09:38.655 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
192.168.2.1     4        65502       0       0        1    0    0 never    Active
192.168.3.1     4        65501       0       0        1    0    0 never    Idle
```

```
R3#show ip bgp summary
BGP router identifier 192.168.3.1, local AS number 65501
BGP table version is 5, main routing table version 5
2 network entries using 496 bytes of memory
2 path entries using 272 bytes of memory
1/1 BGP path/bestpath attribute entries using 288 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
BGP using 1056 total bytes of memory
BGP activity 2/0 prefixes, 2/0 paths, scan interval 60 secs
2 networks peaked at 16:08:20 Nov 20 2025 EST (00:10:20.911 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
192.168.1.1     4        65501       0       0        1    0    0 never    Idle
192.168.2.1     4        65502       0       0        1    0    0 never    Active
```

```
R1#ping 192.168.2.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.2.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

```
R3#ping 192.168.2.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.2.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/8/33 ms
```