chapter7_gns3_exercise
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Lab Report 1. On each router, execute the below command to list the running configuration of the router and include it in your lab report:
R1# show running-config
R1

```
R1#show running-config
Building configuration...

Current configuration : 1036 bytes
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
!
hostname R1
!
boot-start-marker
boot-end-marker
!
!
no aaa new-model
no ip icmp rate-limit unreachable
ip cef
!
!
!
!
no ip domain lookup
no ipv6 cef
!
!
multilink bundle-name authenticated
!
!
!
!
!
!
!
!
ip tcp synwait-time 5
!
!
!
!
!
!
!
!
!
!
!
interface Loopback0
 ip address 110.0.254.1 255.255.255.255
!
interface FastEthernet0/0
 ip address 110.0.120.1 255.255.255.252
 duplex full
!
interface FastEthernet1/0
 ip address 110.0.140.1 255.255.255.252
 duplex full
!
router bgp 110
```

```
 bgp log-neighbor-changes
 network 110.0.0.0
 neighbor 110.0.120.2 remote-as 120
 neighbor 110.0.140.2 remote-as 140
!
ip forward-protocol nd
!
!
no ip http server
no ip http secure-server
ip route 110.0.0.0 255.0.0.0 Null0
!
!
!
!
control-plane
!
!
!
line con 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line aux 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line vty 0 4
 login
!
```

R2

```
R2#show running-config
Building configuration...

Current configuration : 1300 bytes
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
!
hostname R2
!
boot-start-marker
boot-end-marker
!
!
!
no aaa new-model
no ip icmp rate-limit unreachable
ip cef
!
!
!
!
!
!
!
no ip domain lookup
no ipv6 cef
!
multilink bundle-name authenticated
!
!
!
!
!
!
!
!
ip tcp synwait-time 5
!
!
!
!
!
!
!
!
!
!
interface Loopback0
 ip address 120.0.254.2 255.255.255.255
!
interface FastEthernet0/0
 ip address 110.0.120.2 255.255.255.252
 duplex full
!
interface FastEthernet1/0
 ip address 120.0.120.1 255.255.255.252
 duplex full
!
router rip_
```

```
version 2
 redistribute bgp 120 metric 1
 passive-interface FastEthernet0/0
 network 120.0.0.0
!
router bgp 120
 bgp log-neighbor-changes
 network 120.0.0.0
 redistribute rip
 neighbor 110.0.120.1 remote-as 110
 neighbor 120.0.254.3 remote-as 120
 neighbor 120.0.254.3 update-source Loopback0
 neighbor 120.0.254.3 next-hop-self
!
ip forward-protocol nd
!
!
no ip http server
no ip http secure-server
ip route 120.0.0.0 255.0.0.0 Null0
!
!
ip prefix-list LOCAL-ROUTES seq 5 permit 120.0.0.0/8
!
!
control-plane
!
!
line con 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line aux 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line vty 0 4
 login
!
!
end
```

R3

```
R3#show running-config
Building configuration...

Current configuration : 1300 bytes
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
!
hostname R3
!
boot-start-marker
boot-end-marker
!
!
!
no aaa new-model
no ip icmp rate-limit unreachable
ip cef
!
!
!
!
!
!
no ip domain lookup
no ipv6 cef
!
!
multilink bundle-name authenticated
!
!
!
!
!
!
!
!
!
ip tcp synwait-time 5
!
!
!
!
!
!
!
!
!
!
!
!
interface Loopback0
 ip address 120.0.254.3 255.255.255.255
```

```
 ip address 120.0.254.3 255.255.255.255
!
interface FastEthernet0/0
 ip address 120.0.120.6 255.255.255.252
 duplex full
!
interface FastEthernet1/0
 ip address 120.0.130.1 255.255.255.252
 duplex full
!
router rip
 version 2
 redistribute bgp 120 metric 1
 passive-interface FastEthernet1/0
 network 120.0.0.0
!
router bgp 120
 bgp log-neighbor-changes
 network 120.0.0.0
 redistribute rip
 neighbor 120.0.130.2 remote-as 130
 neighbor 120.0.254.2 remote-as 120
 neighbor 120.0.254.2 update-source Loopback0
 neighbor 120.0.254.2 next-hop-self
!
ip forward-protocol nd
!
!
no ip http server
no ip http secure-server
ip route 120.0.0.0 255.0.0.0 Null0
!
!
ip prefix-list LOCAL-ROUTES seq 5 permit 120.0.0.0/8
!
!
!
control-plane
!
!
line con 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line aux 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line vty 0 4
 login
!
!
end
```

R4

```
R4#show running-config
Building configuration...

Current configuration : 910 bytes
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
!
hostname R4
!
boot-start-marker
boot-end-marker
!
!
!
no aaa new-model
no ip icmp rate-limit unreachable
ip cef
!
!
!
!
!
no ip domain lookup
no ipv6 cef
!
!
multilink bundle-name authenticated
!
!
!
!
!
!
!
!
!
ip tcp synwait-time 5
!
!
!
!
!
!
!
!
!
!
!
interface Loopback0
 ip address 120.0.254.4 255.255.255.255
!
```

```
 ip address 120.0.254.4 255.255.255.255
!
interface FastEthernet0/0
 ip address 120.0.120.2 255.255.255.252
 duplex full
!
interface FastEthernet1/0
 ip address 120.0.120.5 255.255.255.252
 duplex full
!
router rip
 version 2
 network 120.0.0.0
!
ip forward-protocol nd
!
!
no ip http server
no ip http secure-server
!
!
!
control-plane
!
!
line con 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line aux 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line vty 0 4
 login
!
!
end
```

R5

```
R5#show running-config
Building configuration...

Current configuration : 1036 bytes
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
!
hostname R5
!
boot-start-marker
boot-end-marker
!
!
!
no aaa new-model
no ip icmp rate-limit unreachable
ip cef
!
!
!
!
!
no ip domain lookup
no ipv6 cef
!
!
multilink bundle-name authenticated
!
!
!
!
!
!
!
!
ip tcp synwait-time 5
!
!
!
!
!
!
!
!
interface Loopback0
 ip address 130.0.254.5 255.255.255.255
!
interface FastEthernet0/0
```

```
 ip address 120.0.130.2 255.255.255.252
 duplex full
!
interface FastEthernet1/0
 ip address 130.0.140.1 255.255.255.252
 duplex full
!
router bgp 130
 bgp log-neighbor-changes
 network 130.0.0.0
 neighbor 120.0.130.1 remote-as 120
 neighbor 130.0.140.2 remote-as 140
!
ip forward-protocol nd
!
!
no ip http server
no ip http secure-server
ip route 130.0.0.0 255.0.0.0 Null0
!
!
!
!
control-plane
!
!
line con 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line aux 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line vty 0 4
 login
!
!
end
```

R6

```
R6#show running-config
Building configuration...

Current configuration : 1036 bytes
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
!
hostname R6
!
boot-start-marker
boot-end-marker
!
!
!
no aaa new-model
no ip icmp rate-limit unreachable
ip cef
!
!
!
!
!
!
!
no ip domain lookup
no ipv6 cef
!
!
multilink bundle-name authenticated
!
!
!
!
!
!
!
!
!
!
ip tcp synwait-time 5
!
!
!
!
!
!
!
!
!
!
interface Loopback0
 ip address 140.0.254.6 255.255.255.255
!
```

```
 ip address 140.0.254.6 255.255.255.255
!
interface FastEthernet0/0
 ip address 110.0.140.2 255.255.255.252
 duplex full
!
interface FastEthernet1/0
 ip address 130.0.140.2 255.255.255.252
 duplex full
!
router bgp 140
 bgp log-neighbor-changes
 network 140.0.0.0
 neighbor 110.0.140.1 remote-as 110
 neighbor 130.0.140.1 remote-as 130
!
ip forward-protocol nd
!
!
no ip http server
no ip http secure-server
ip route 140.0.0.0 255.0.0.0 Null0
!
!
!
!
control-plane
!
!
line con 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line aux 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line vty 0 4
 login
!
!
end
```

Lab Report 2. Using the Wireshark captured packets on link R1-R2, answer the following questions
and include them in your lab report:

1. How many different types of BGP messages do you see in your Wireshark screen?
   - 3 types of BGP packets, KEEPALIVE message, OPEN message, Update message, TCP update.
   - There was also retransmitted TCP update message.

2. Pick a BGP Update message on your Wireshark screen and list the BGP attributes that you see included in this update message. In one sentence each, describe the utility/function of each of these attributes. Include your answers in your lab report.
   - I picked packet 169 from R1-R2 capture
   - The marker field on top is used to indicate use of MD5 authentication. When it's filled with 1s or fs then it is not using authentication.
   - Update message contains following fields
   - Withdrawn Route Length shows the length of the Withdrawn Routes field in bytes. When it is set to 0, there are no routes withdrawn and the Withdrawn Routes field will not show up.
   - Withdrawn Routes shows all the prefixes that should be removed from the BGP table.
   - Total Path Attribute Length shows total length of the Path Attributes field.
   - Path Attributes shows the BGP attributes for the prefix are given here like origin, next hop as path, med local preferences and they are in Type, length and value format.
   - Each of the BGP attributes also has an attribute flag that tells the BGP router how to treat the attribute.
   - Packet 169's specific fields are listed below
   - 169 is not using authentication
   - Withdrawn route length is 0, so no routes are withdrawn
   - No prefixes are removed
   - Total path attribute length is 20 bytes
   - BGP attribute shows origin unknown, shows path attribute to as-path 120, next hop is 110.0.120.2 to reach 110.0.0.0/8

3. On the Wireshark screen, identify a BGP Update message that R1 originates. By looking at the packet content, how can you tell that this update message is originated by R1?
   - You can tell packets orginates from R1 using AS-Path because it always has path from current AS is advertised, so if I am advertising path to 120 and 130, I would have path 110, 120 or 110, 130. That is how you can tell what AS BGP message originates.
   - You can also tell which router the message originate from if you look at OPEN packet, it has BGP router id for identification.

4. Now, look at the Wireshark screen that you run on R2-R4 link. On this Wireshark screen, can you identify a BGP update message that is originated by R1 and is forwarded from R2 to R4? What is the next-hop attribute value on this BGP update message? Is it the same as the one in the BGP update for the same destination prefix that you observed on your Wireshark screen for R1-R2 link in the previous step? Explain why.
   - No, next hop value has changed to loopback 0 interface of R2 120.0.254.2. Because what captured between R2 and R4 is ibgp communication between R2 and R3 and for updated route sent to R3, it changes next-hop to itself for R3 because route to AS 110 is advertised by R2 to R3 and R2 is advertising that path to AS 110 can be me.

Lab Report 3. Using the configuration information on the routers, follow the below directions and provide the requested data as well as your answers to the questions in your lab report.

1. Run the following command on each BGP speaker router (R1 to R6 except R4) and include the output in your lab report:

   R1# show ip bgp summary
   R1

```
R1#show ip bgp summary
BGP router identifier 110.0.254.1, local AS number 110
BGP table version is 9, main routing table version 9
8 network entries using 1152 bytes of memory
9 path entries using 720 bytes of memory
6/5 BGP path/bestpath attribute entries using 816 bytes of memory
1 BGP AS-PATH entries using 24 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 2712 total bytes of memory
BGP activity 8/0 prefixes, 34/25 paths, scan interval 60 secs

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
110.0.120.2     4          120     172     116        9    0    0 01:40:13        8
110.0.140.2     4          140     115     118        9    0    0 01:39:56        0
R1#
```

   R2

```
R2#show ip bgp summary
BGP router identifier 120.0.254.2, local AS number 120
BGP table version is 1527, main routing table version 1527
8 network entries using 1152 bytes of memory
15 path entries using 1200 bytes of memory
9/5 BGP path/bestpath attribute entries using 1224 bytes of memory
1 BGP AS-PATH entries using 24 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 3600 total bytes of memory
BGP activity 8/0 prefixes, 774/759 paths, scan interval 60 secs

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
110.0.120.1     4          110     116     172     1520    0    0 01:40:59        1
120.0.254.3     4          120    1532    1527     1527    0    0 01:40:08        7
```

R3

```
R3#show ip bgp summary
BGP router identifier 120.0.254.3, local AS number 120
BGP table version is 3047, main routing table version 3047
8 network entries using 1152 bytes of memory
15 path entries using 1200 bytes of memory
9/5 BGP path/bestpath attribute entries using 1224 bytes of memory
1 BGP AS-PATH entries using 24 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 3600 total bytes of memory
BGP activity 8/0 prefixes, 1536/1521 paths, scan interval 60 secs

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down   State/PfxRcd
120.0.130.2     4          130     142     202     3039    0    0 01:40:28        0
120.0.254.2     4          120    1529    1534     3047    0    0 01:40:02        8
```

R5

```
R5#show ip bgp summary
BGP router identifier 130.0.254.5, local AS number 130
BGP table version is 59, main routing table version 59
8 network entries using 1152 bytes of memory
16 path entries using 1280 bytes of memory
8/5 BGP path/bestpath attribute entries using 1088 bytes of memory
4 BGP AS-PATH entries using 96 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 3616 total bytes of memory
BGP activity 8/0 prefixes, 17/1 paths, scan interval 60 secs

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down   State/PfxRcd
120.0.130.1     4          120     202     142       59    0    0 01:40:29        8
130.0.140.2     4          140     116     142       59    0    0 01:40:34        8
```

R6

```
R6#show ip bgp summary
BGP router identifier 140.0.254.6, local AS number 140
BGP table version is 9, main routing table version 9
8 network entries using 1152 bytes of memory
16 path entries using 1280 bytes of memory
6/3 BGP path/bestpath attribute entries using 816 bytes of memory
4 BGP AS-PATH entries using 96 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 3344 total bytes of memory
BGP activity 8/0 prefixes, 17/1 paths, scan interval 60 secs

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down   State/PfxRcd
110.0.140.1     4          110     118     116        9    0    0 01:40:37        8
130.0.140.1     4          130     142     116        9    0    0 01:40:29        8
```

2. Run the following commands on R2 and include their output in your lab report:

R2# show ip route and R2# show ip bgp

```
R2#show ip route
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
       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
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

      110.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
B        110.0.0.0/8 [20/0] via 110.0.120.1, 00:00:00
C        110.0.120.0/30 is directly connected, FastEthernet0/0
L        110.0.120.2/32 is directly connected, FastEthernet0/0
      120.0.0.0/8 is variably subnetted, 8 subnets, 3 masks
S        120.0.0.0/8 is directly connected, Null0
C        120.0.120.0/30 is directly connected, FastEthernet1/0
L        120.0.120.1/32 is directly connected, FastEthernet1/0
R        120.0.120.4/30 [120/1] via 120.0.120.2, 00:00:03, FastEthernet1/0
R        120.0.130.0/30 [120/2] via 120.0.120.2, 00:00:03, FastEthernet1/0
C        120.0.254.2/32 is directly connected, Loopback0
R        120.0.254.3/32 [120/2] via 120.0.120.2, 00:00:03, FastEthernet1/0
R        120.0.254.4/32 [120/1] via 120.0.120.2, 00:00:03, FastEthernet1/0
R     130.0.0.0/16 [120/2] via 120.0.120.2, 00:00:01, FastEthernet1/0
B     140.0.0.0/16 [20/0] via 110.0.120.1, 00:48:04
R2#show ip bg
R2#show ip bgp
BGP table version is 1651, local router ID is 120.0.254.2
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,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>i 110.0.0.0        120.0.254.3              2    100      0 ?
 *                    110.0.120.1              0             0 110 i
 * i 120.0.0.0        120.0.254.3              0    100      0 ?
 *>                   0.0.0.0                  0         32768 ?
 *>i 130.0.0.0        120.0.254.3              0    100      0 130 i
 * i 140.0.0.0        120.0.254.3              0    100      0 130 140 i
 *>                   110.0.120.1                           0 110 140 i
```

The command show ip route above displays the content of the main routing table (RIB) on a router and the command show ip bgp displays the content of the BGP routing table. The RIB is populated by the router by choosing the best route for each destination among the available routes learned by different means (i.e., learned by different routing protocols). First, using the header part of the output for each command, familiarize yourself with the information provided in each line in the output of these commands. Then, answer the following questions and include your answers in your lab report:

(a) Is there a route for prefix 110.0.0.0/8 in the RIB of R2? How is this route learned? Who is the next hop for this route?

- Yes, this route is learned throw BGP, next hop is throw 110.0.120.1

(b) Is there a route for prefix 110.0.0.0/8 in the BGP routing table of R2? Who is the next hop for this route?
-   Yes, 110.0.120.1, path is 110 i

(c) Are the routes for prefix 110.0.0.0/8 in RIB and in BGP routing table congruent? If not, explain the reason why?
-   Yes, they are since rib route is also learned and redistributed throw bgp, it would make sense so that they are same.

(d) Is there a route for prefix 130.0.0.0/16 in the RIB of R2? How is this route learned? Who is the next hop for this route?
-   Yes, 130.0.0.0/16 is in RIB table of R2. Route is learned throw RIP. Next hop is 120.0.120.2.

(e) Is there a route for prefix 130.0.0.0/16 in the BGP routing table of R2? Who is the next hop for this route?
-   Yes, 130.0.0.0/16 is in the BGP table of R2. Next hop is 120.0.254.3.

(f) Are the routes for prefix 130.0.0.0/16 in RIB and in BGP routing table congruent? If not, explain the reason why? *Hint:* Consult Table 5.3 and the discussion related to administrative distances in Section 5.4.3.
-   No, they are not congruent. Because route is found using 2 different protocols, RIB goes throw R1 while BGP goes throw R3, default for bgp is 200 while rip is 120, so bgp chooses rip transfer and R2 chooses R1 based on rip protocol.

7.7.2 Policy Routing on Selecting a Primary Exit Route for Outbound Traffic

Assume that AS 120 adapts a new policy rule saying that R2 should be the primary exit router for all outgoing traffic to external destinations and R3 should be used as the backup router for outgoing traffic. Your job now is to introduce necessary configuration changes to the router(s) in
AS 120 to implement this policy rule.

Lab Report 4. Once you are done with your configuration changes and verify that it is working, include the following in your lab report:

1. Which routers did you make modifications on? Include their names in your lab report.
-   R2 and R3, Weight of R2 to R1 link was lowered, R2 local preference was set to 200 and R3 to R5 AS was prepended by 120 twice.

2. Run the below command on those routers that you modified and include the output of the
command in your lab report:

Router# show running-config
R2

```
R2#show running-config
Building configuration...

Current configuration : 1443 bytes
!
! Last configuration change at 13:46:06 UTC Mon Apr 22 2019
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
!
hostname R2
!
boot-start-marker
boot-end-marker
!
!
!
no aaa new-model
no ip icmp rate-limit unreachable
ip cef
!
!
!
!
no ip domain lookup
no ipv6 cef
!
!
multilink bundle-name authenticated
!
!
!
!
!
!
ip tcp synwait-time 5
```

```
interface Loopback0
 ip address 120.0.254.2 255.255.255.255
!
interface FastEthernet0/0
 ip address 110.0.120.2 255.255.255.252
 duplex full
!
interface FastEthernet1/0
 ip address 120.0.120.1 255.255.255.252
 duplex full
!
router rip
 version 2
 redistribute bgp 120 metric 1
 passive-interface FastEthernet0/0
 network 120.0.0.0
!
router bgp 120
 bgp log-neighbor-changes
 bgp default local-preference 200
 network 120.0.0.0
 redistribute rip
 neighbor 110.0.120.1 remote-as 110
 neighbor 110.0.120.1 weight 100
 neighbor 120.0.254.3 remote-as 120
 neighbor 120.0.254.3 update-source Loopback0
 neighbor 120.0.254.3 next-hop-self
 auto-summary
!
ip forward-protocol nd
!
!
no ip http server
no ip http secure-server
ip route 120.0.0.0 255.0.0.0 Null0
!
!
ip prefix-list LOCAL-ROUTES seq 5 permit 120.0.0.0/8
!
!
!
control-plane
!
!
line con 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line aux 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line vty 0 4
 login
!
!
end
```

R3

```
R3#show running-config
Building configuration...

Current configuration : 1510 bytes
!
! Last configuration change at 13:50:10 UTC Mon Apr 22 2019
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
!
hostname R3
!
boot-start-marker
boot-end-marker
!
!
!
no aaa new-model
no ip icmp rate-limit unreachable
ip cef
!
!
!
!
no ip domain lookup
no ipv6 cef
!
!
multilink bundle-name authenticated
!
!
!
!
!
!
!
!
!
!
ip tcp synwait-time 5
```

```
interface Loopback0
 ip address 120.0.254.3 255.255.255.255
!
interface FastEthernet0/0
 ip address 120.0.120.6 255.255.255.252
 duplex full
!
interface FastEthernet1/0
 ip address 120.0.130.1 255.255.255.252
 duplex full
!
router rip
 version 2
 redistribute bgp 120 metric 1
 passive-interface FastEthernet1/0
 network 120.0.0.0
!
router bgp 120
 bgp log-neighbor-changes
 bgp default local-preference 5
 network 120.0.0.0
 redistribute rip
 neighbor 120.0.130.2 remote-as 130
 neighbor 120.0.130.2 route-map prepend in
 neighbor 120.0.254.2 remote-as 120
 neighbor 120.0.254.2 update-source Loopback0
 neighbor 120.0.254.2 next-hop-self
 auto-summary
!
ip forward-protocol nd
!
!
no ip http server
no ip http secure-server
ip route 120.0.0.0 255.0.0.0 Null0
!
!
ip prefix-list LOCAL-ROUTES seq 5 permit 120.0.0.0/8
!
route-map prepend permit 10
 set as-path prepend 120 120
!
!
!
control-plane
!
!
line con 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line aux 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 stopbits 1
line vty 0 4
 login
!
```

3. Run the below command on R2 and R3 and include the output of the command in your lab
report:

R2# show ip bpg
R2

```
R2#show ip bgp
BGP table version is 3448, local router ID is 120.0.254.2
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,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 * i 110.0.0.0        120.0.254.3              2      5      0 ?
 *>                   110.0.120.1              0             0 110 i
 * i 120.0.0.0        120.0.254.3              0      5      0 ?
 *>                   0.0.0.0                  0         32768 ?
 * i 130.0.0.0        120.0.254.3              2      5      0 ?
 *>                   110.0.120.1                        100 110 140 130 i
 * i 140.0.0.0        120.0.254.3              2      5      0 ?
 *>                   110.0.120.1                          0 110 140 i
```

R3

```
R3#show ip bgp
BGP table version is 3132, local router ID is 120.0.254.3
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,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>  110.0.0.0        120.0.120.5              2         32768 ?
 * i                 120.0.254.2              0    200      0 110 i
 * i 120.0.0.0        120.0.254.2              0    200      0 ?
 *>                   0.0.0.0                  0         32768 ?
 *>  130.0.0.0        120.0.120.5              2         32768 ?
 * i                 120.0.254.2              0    200      0 110 140 130 i
 *                   120.0.130.2              0             0 120 120 130 i
 *>  140.0.0.0        120.0.120.5              2         32768 ?
 * i                 120.0.254.2              0    200      0 110 140 i
 *                   120.0.130.2                          0 120 120 130 140 i
```

4. Run the below command on R2 and R3 and include the output of the command in your lab report:

R2# show ip route

R2

```
R2#show ip route
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
       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
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

      110.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
B        110.0.0.0/8 [20/0] via 110.0.120.1, 00:33:30
C        110.0.120.0/30 is directly connected, FastEthernet0/0
L        110.0.120.2/32 is directly connected, FastEthernet0/0
      120.0.0.0/8 is variably subnetted, 8 subnets, 3 masks
S        120.0.0.0/8 is directly connected, Null0
C        120.0.120.0/30 is directly connected, FastEthernet1/0
L        120.0.120.1/32 is directly connected, FastEthernet1/0
R        120.0.120.4/30 [120/1] via 120.0.120.2, 00:00:06, FastEthernet1/0
R        120.0.130.0/30 [120/2] via 120.0.120.2, 00:00:06, FastEthernet1/0
C        120.0.254.2/32 is directly connected, Loopback0
R        120.0.254.3/32 [120/2] via 120.0.120.2, 00:00:06, FastEthernet1/0
R        120.0.254.4/32 [120/1] via 120.0.120.2, 00:00:06, FastEthernet1/0
B     130.0.0.0/16 [20/0] via 110.0.120.1, 00:12:50
B     140.0.0.0/16 [20/0] via 110.0.120.1, 00:33:30
```

R3

```
R3#show ip route
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
       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
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

R     110.0.0.0/8 [120/2] via 120.0.120.5, 00:00:22, FastEthernet0/0
      120.0.0.0/8 is variably subnetted, 9 subnets, 3 masks
S        120.0.0.0/8 is directly connected, Null0
R        120.0.120.0/30 [120/1] via 120.0.120.5, 00:00:22, FastEthernet0/0
C        120.0.120.4/30 is directly connected, FastEthernet0/0
L        120.0.120.6/32 is directly connected, FastEthernet0/0
C        120.0.130.0/30 is directly connected, FastEthernet1/0
L        120.0.130.1/32 is directly connected, FastEthernet1/0
R        120.0.254.2/32 [120/2] via 120.0.120.5, 00:00:22, FastEthernet0/0
C        120.0.254.3/32 is directly connected, Loopback0
R        120.0.254.4/32 [120/1] via 120.0.120.5, 00:00:22, FastEthernet0/0
R     130.0.0.0/16 [120/2] via 120.0.120.5, 00:00:22, FastEthernet0/0
R     140.0.0.0/16 [120/2] via 120.0.120.5, 00:00:22, FastEthernet0/0
```