

19-1 RIP Configuration - Answer Key

In this lab you will configure the RIPv2 routing protocol.

RIP Configuration

- 1) Enable RIPv2 on every router. Ensure all networks except 203.0.113.0/24 are advertised. Do not perform any summarisation.

On every router:

```
R1(config)#router rip
R1(config-router)#version 2
R1(config-router)#no auto-summary
R1(config-router)#network 10.0.0.0
```

- 2) Verify all networks are in the router's routing tables.

R1#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

```
10.0.0.0/8 is variably subnetted, 12 subnets, 2 masks
C    10.0.0.0/24 is directly connected, FastEthernet0/0
L    10.0.0.1/32 is directly connected, FastEthernet0/0
C    10.0.1.0/24 is directly connected, FastEthernet1/0
L    10.0.1.1/32 is directly connected, FastEthernet1/0
C    10.0.2.0/24 is directly connected, FastEthernet2/0
L    10.0.2.1/32 is directly connected, FastEthernet2/0
C    10.0.3.0/24 is directly connected, FastEthernet3/0
L    10.0.3.1/32 is directly connected, FastEthernet3/0
R    10.1.0.0/24 [120/1] via 10.0.0.2, 00:00:21, FastEthernet0/0
R    10.1.1.0/24 [120/2] via 10.0.3.2, 00:00:20, FastEthernet3/0
      [120/2] via 10.0.0.2, 00:00:21, FastEthernet0/0
R    10.1.2.0/24 [120/2] via 10.0.3.2, 00:00:20, FastEthernet3/0
R    10.1.3.0/24 [120/1] via 10.0.3.2, 00:00:20, FastEthernet3/0
```

- 3) Enable summarisation using a /16 mask on the routers which are at the boundary of the 10.0.0.0/16 and 10.1.0.0/16 networks.

Configure summarisation in both directions on the R2 and R5 routers.

```
R2(config)#int f0/0
R2(config-if)#ip summary-address rip 10.1.0.0 255.255.0.0
R2(config)#int f1/0
R2(config-if)#ip summary-address rip 10.0.0.0 255.255.0.0

R5(config)#int f3/0
R5(config-if)#ip summary-address rip 10.1.0.0 255.255.0.0
R5(config)#int f2/0
R5(config-if)#ip summary-address rip 10.0.0.0 255.255.0.0
```

- 4) What change do you expect to see on R1's routing table? Verify this (give the routing table a couple of minutes to converge).

R1 will have a single /16 summary route to the 10.1.0.0 networks rather than individual /24 routes. The routes will use Equal Cost Multi Path through routers R2 and R5.

Before summarisation with individual /24 routes:

```
R1#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

```
10.0.0.0/8 is variably subnetted, 12 subnets, 2 masks
C    10.0.0.0/24 is directly connected, FastEthernet0/0
L    10.0.0.1/32 is directly connected, FastEthernet0/0
C    10.0.1.0/24 is directly connected, FastEthernet1/0
L    10.0.1.1/32 is directly connected, FastEthernet1/0
C    10.0.2.0/24 is directly connected, FastEthernet2/0
L    10.0.2.1/32 is directly connected, FastEthernet2/0
C    10.0.3.0/24 is directly connected, FastEthernet3/0
L    10.0.3.1/32 is directly connected, FastEthernet3/0
R    10.1.0.0/24 [120/1] via 10.0.0.2, 00:00:21, FastEthernet0/0
R    10.1.1.0/24 [120/2] via 10.0.3.2, 00:00:20, FastEthernet3/0
      [120/2] via 10.0.0.2, 00:00:21, FastEthernet0/0
R    10.1.2.0/24 [120/2] via 10.0.3.2, 00:00:20, FastEthernet3/0
R    10.1.3.0/24 [120/1] via 10.0.3.2, 00:00:20, FastEthernet3/0
```

After summarisation with ECMP /16 summarised routes:

R1#sh 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

```
10.0.0.0/8 is variably subnetted, 9 subnets, 3 masks
C    10.0.0.0/24 is directly connected, FastEthernet0/0
L    10.0.0.1/32 is directly connected, FastEthernet0/0
C    10.0.1.0/24 is directly connected, FastEthernet1/0
L    10.0.1.1/32 is directly connected, FastEthernet1/0
C    10.0.2.0/24 is directly connected, FastEthernet2/0
L    10.0.2.1/32 is directly connected, FastEthernet2/0
C    10.0.3.0/24 is directly connected, FastEthernet3/0
L    10.0.3.1/32 is directly connected, FastEthernet3/0
R    10.1.0.0/16 [120/1] via 10.0.3.2, 00:00:29, FastEthernet3/0
      [120/1] via 10.0.0.2, 00:00:21, FastEthernet0/0
```

5) Will R4's routes to the 10.0.x.x networks mirror R1's routes to the 10.1.x.x networks? Verify this.

No. R4 will have a 10.0.0.0/16 summary route with a single next hop of 10.1.3.2 on R5 and a hop count of 1. It will not load balance traffic through R2 as well because that path would have a hop count of 2. (R4 is not directly adjacent to R2 as R1 is, it is an extra hop away.)

R4#sh 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

```
10.0.0.0/8 is variably subnetted, 8 subnets, 3 masks
R    10.0.0.0/16 [120/1] via 10.1.3.2, 00:00:03, FastEthernet2/0
R    10.1.0.0/24 [120/1] via 10.1.1.2, 00:00:23, FastEthernet0/0
C    10.1.1.0/24 is directly connected, FastEthernet0/0
L    10.1.1.1/32 is directly connected, FastEthernet0/0
C    10.1.2.0/24 is directly connected, FastEthernet1/0
L    10.1.2.1/32 is directly connected, FastEthernet1/0
C    10.1.3.0/24 is directly connected, FastEthernet2/0
L    10.1.3.1/32 is directly connected, FastEthernet2/0
```

```

        203.0.113.0/24 is variably subnetted, 2 subnets, 2 masks
C        203.0.113.0/24 is directly connected, FastEthernet3/0
L        203.0.113.1/32 is directly connected, FastEthernet3/0

```

- 6) Verify that routing is working by checking that PC1 has connectivity to PC3.

```

PC1> ping 10.1.2.10
84 bytes from 10.1.2.10 icmp_seq=1 ttl=61 time=157.988 ms
84 bytes from 10.1.2.10 icmp_seq=2 ttl=61 time=108.570 ms
84 bytes from 10.1.2.10 icmp_seq=3 ttl=61 time=108.848 ms
84 bytes from 10.1.2.10 icmp_seq=4 ttl=61 time=108.576 ms
84 bytes from 10.1.2.10 icmp_seq=5 ttl=61 time=115.893 ms

```

- 7) Ensure that all routers have a route to the 203.0.113.0/24 network.
Internal routes must not be advertised to the Service Provider at 203.0.113.2.

The 203.0.113.0/24 network must be added to the RIP process on R4, and interface FastEthernet 3/0 facing the service provider configured as a passive interface to avoid sending out internal network information.

```

R4(config)#router rip
R4(config-router)#passive-interface f3/0
R4(config-router)#network 203.0.113.0

```

- 8) Verify that all routers have a path to the 203.0.113.0/24 network.

```

R1#sh 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

```

        10.0.0.0/8 is variably subnetted, 9 subnets, 3 masks
C        10.0.0.0/24 is directly connected, FastEthernet0/0
L        10.0.0.1/32 is directly connected, FastEthernet0/0
C        10.0.1.0/24 is directly connected, FastEthernet1/0
L        10.0.1.1/32 is directly connected, FastEthernet1/0
C        10.0.2.0/24 is directly connected, FastEthernet2/0
L        10.0.2.1/32 is directly connected, FastEthernet2/0
C        10.0.3.0/24 is directly connected, FastEthernet3/0
L        10.0.3.1/32 is directly connected, FastEthernet3/0
R        10.1.0.0/16 [120/1] via 10.0.3.2, 00:00:18, FastEthernet3/0
                    [120/1] via 10.0.0.2, 00:00:24, FastEthernet0/0
R        203.0.113.0/24 [120/2] via 10.0.3.2, 00:00:18, FastEthernet3/0

```

- 9) Configure a default static route on R4 to the Internet via the service provider at 203.0.113.2

```
R4(config)#ip route 0.0.0.0 0.0.0.0 203.0.113.2
```

- 10) Ensure that all other routers learn via RIP how to reach the Internet.

Inject the default static route into RIP on R4.

```
R4(config)#router rip
R4(config-router)#default-information originate
```

- 11) Verify all routers have a route to the Internet.

```
R1#sh 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 10.0.3.2 to network 0.0.0.0

```
R*    0.0.0.0/0 [120/2] via 10.0.3.2, 00:00:05, FastEthernet3/0
      10.0.0.0/8 is variably subnetted, 9 subnets, 3 masks
C      10.0.0.0/24 is directly connected, FastEthernet0/0
L      10.0.0.1/32 is directly connected, FastEthernet0/0
C      10.0.1.0/24 is directly connected, FastEthernet1/0
L      10.0.1.1/32 is directly connected, FastEthernet1/0
C      10.0.2.0/24 is directly connected, FastEthernet2/0
L      10.0.2.1/32 is directly connected, FastEthernet2/0
C      10.0.3.0/24 is directly connected, FastEthernet3/0
L      10.0.3.1/32 is directly connected, FastEthernet3/0
R      10.1.0.0/16 [120/1] via 10.0.3.2, 00:00:05, FastEthernet3/0
                        [120/1] via 10.0.0.2, 00:00:08, FastEthernet0/0
R      203.0.113.0/24 [120/2] via 10.0.3.2, 00:00:05, FastEthernet3/0
```

- 12) Set the RIP timers to half their current settings on all routers.

Check the current timers first.

```
R1#sh ip protocols | include seconds
```

```
Sending updates every 30 seconds, next due in 14 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
```

On all routers:

```
R1(config)#router rip
```

```
R1(config-router)#timers basic 15 90 90 120
```