计算机网络实验报告

警示

1. 实验报告如有雷同，雷同各方当次实验成绩均以 0 分计。
2. 当次小组成员成绩只计学号、姓名登录在下表中的。
3. 在规定时间内未上交实验报告的，不得以其他方式补交，当次成绩按 0 分计。
4. 实验报告文件以 PDF 格式提交。

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余世龍	按照实验步骤进行操作，记录实验数据，对实验数据进行分析，并且完成实验报告				

【实验题目】**RIP 路由协议实验**

【实验目的】（请思考后补齐）

1. 了解和学习 RIPv1 协议和 RIPv2 协议。
2. 通过实验验证 RIPv1 协议和 RIPv2 协议的区别。
3. 学习如何在路由器上配置 RIPv2
4. 学习 Debug 命令并对信息做分析

【实验内容】

1. 在实验设备上完成 P243 实验 7-2 并测试实验网连通性。
2. 通过实验观察 RIP V1 和 V2 的区别（重点在 VLSM 上）给出分析过程与结果（实验 IP 采用 10.10.x.0 网段）
3. 学会使用 Debug ip packet 和 Debug ip rip 命令，并对 debug 信息做分析。
4. 观察试验拓扑中链路状态发生改变时路由表的前后信息对比及 debug 信息的变化。

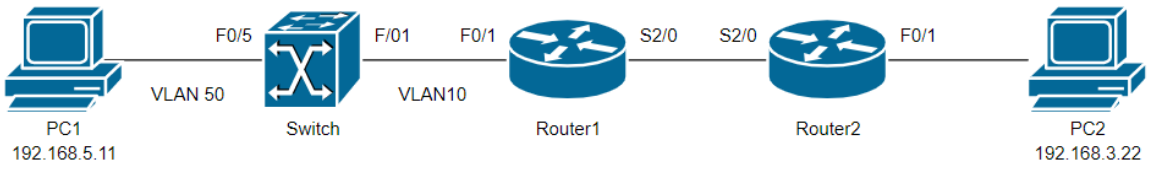
【实验要求】

重要信息信息需给出截图， 注意实验步骤的前后对比。

【实验记录】(如有实验拓扑请自行画出)

1. 在实验设备上完成 P243 实验 7-2 并测试实验网连通性。

实验拓扑图:



1）按照拓扑图配置 PC1 和 PC2 的 IP 地址等信息，并测试他们的连通性

```
C:\Users\Administrator>ping 192.168.5.11

正在 Ping 192.168.5.11 具有 32 字节的数据:
请求超时。
请求超时。
请求超时。
请求超时。

192.168.5.11 的 Ping 统计信息:
    数据包: 已发送 = 4, 已接收 = 0, 丢失 = 4 (100% 丢失),
```

以上结果可以看到 PC1 和 PC2 没有相互联通，原因是路由器和交换机的接口并没有配置。

在路由器上执行 show ip route 命令，记录路由表信息

```
21-RSR20-2(config)#show ip route

Codes:  C - connected, S - static, R - RIP, B - BGP
        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

Gateway of last resort is no set
```

还没有 R 条目。

2）三层交换机的基本配置，配置 VLAN 虚拟端口 IP 地址

```
28-s5750-1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
28-s5750-1(config)#hostname s5750
s5750(config)#vlan 10
s5750(config-vlan)#exit
s5750(config)#vlan 50
s5750(config-vlan)#exit
s5750(config)#interface gigabitethernet 0/1
s5750(config-if-GigabitEthernet 0/1)#switchport access vlan 10
s5750(config-if-GigabitEthernet 0/1)#exit
s5750(config)#interface gigabitethernet 0/5
s5750(config-if-GigabitEthernet 0/5)#switchport access vlan 50
s5750(config-if-GigabitEthernet 0/5)#exit
s5750(config)#interface vlan 10
s5750(config-if-VLAN 10)#*Jun  4 08:58:38: %LINEPROTO-5-UPDOWN: Line protocol on Interface VLAN 10, changed
 state to up.

s5750(config-if-VLAN 10)#ip address 192.168.1.2 255.255.255.0
s5750(config-if-VLAN 10)#no shutdown
s5750(config-if-VLAN 10)#exit
s5750(config)#interface vlan 50
s5750(config-if-VLAN 50)#*Jun  4 08:59:26: %LINEPROTO-5-UPDOWN: Line protocol on Interface VLAN 50, changed
 state to up.

s5750(config-if-VLAN 50)#ip address 192.168.5.1 255.255.255.0
s5750(config-if-VLAN 50)#no shutdown
s5750(config-if-VLAN 50)#exit
s5750(config)#
```

3）路由器 R1 的基本配置，配置端口 IP 地址

```
21-RSR20-1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
21-RSR20-1(config)#interface gigabitethernet 0/1
21-RSR20-1(config-if-GigabitEthernet 0/1)#$2.168.1.1 255.255.255.0
21-RSR20-1(config-if-GigabitEthernet 0/1)#no shutdown
21-RSR20-1(config-if-GigabitEthernet 0/1)#exit
21-RSR20-1(config)#interface serial 2/0
21-RSR20-1(config-if-Serial 2/0)#ip address 192.168.2.1 255.255.255.0
21-RSR20-1(config-if-Serial 2/0)#no shutdown
```

4）路由器 R2 的基本配置，配置端口 IP 地址

```
21-RSR20-2(config)#interface gigabitethernet 0/1
21-RSR20-2(config-if-GigabitEthernet 0/1)#$2.168.3.1 255.255.255.0
21-RSR20-2(config-if-GigabitEthernet 0/1)#no shutdown
21-RSR20-2(config-if-GigabitEthernet 0/1)#exit
21-RSR20-2(config)#interface serial 2/0
21-RSR20-2(config-if-Serial 2/0)#ip address 192.168.2.2 255.255.255.0
21-RSR20-2(config-if-Serial 2/0)#no shutdown
21-RSR20-2(config-if-Serial 2/0)#exit
21-RSR20-2(config)#
```

5）交换机 S5750 配置 RIPv2 路由协议

```
s5750(config)#router rip
s5750(config-router)#version 2
s5750(config-router)#network 192.168.1.0
s5750(config-router)#network 192.168.5.0
s5750(config-router)#
```

6）路由器 R1 配置 RIPv2 路由协议，并且关闭自动汇总

```
21-RSR20-1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
21-RSR20-1(config)#router rip
21-RSR20-1(config-router)#version 2
21-RSR20-1(config-router)#no auto-summary
21-RSR20-1(config-router)#network 192.168.1.0
21-RSR20-1(config-router)#network 192.168.2.0
21-RSR20-1(config-router)#
```

7）路由器 R2 配置 RIPv2 路由协议，并且关闭自动汇总

```
21-RSR20-2(config)#router rip
21-RSR20-2(config-router)#version 2
21-RSR20-2(config-router)#no auto-summary
21-RSR20-2(config-router)#network 192.168.2.0
21-RSR20-2(config-router)#network 192.168.3.0
21-RSR20-2(config-router)#
```

验证 3 台路由设备的路由表，查看是否自动学习了其他网段的路由信息，注意观察 R 标签项

分析交换机 S5750 的路由表，表中有 R 条目吗？是怎样产生的？

```
s5750(config-router)#show ip route

Codes:  C - connected, S - static, R - RIP, B - BGP
        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

Gateway of last resort is no set
C    192.168.1.0/24 is directly connected, VLAN 10
C    192.168.1.2/32 is local host.
R    192.168.2.0/24 [120/1] via 192.168.1.1, 00:01:35, VLAN 10
R    192.168.3.0/24 [120/2] via 192.168.1.1, 00:00:45, VLAN 10
C    192.168.5.0/24 is directly connected, VLAN 50
C    192.168.5.1/32 is local host.
s5750(config-router)#
```

有两个 R 条目，通过向 R1 和 R2 学习，产生动态路由，目标网段为 192.168.2.0 和 192.168.3.0，下一条地址均为 192.168.1.1，出站接口为 VLAN 10。

分析交换机 R1 的路由表，表中有 R 条目吗？是怎样产生的？

```
21-RSR20-1(config-router)#show ip route

Codes:  C - connected, S - static, R - RIP, B - BGP
        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

Gateway of last resort is no set
C    192.168.1.0/24 is directly connected, GigabitEthernet 0/1
C    192.168.1.1/32 is local host.
C    192.168.2.0/24 is directly connected, Serial 2/0
C    192.168.2.1/32 is local host.
R    192.168.3.0/24 [120/1] via 192.168.2.2, 00:01:27, Serial 2/0
R    192.168.5.0/24 [120/1] via 192.168.1.2, 00:02:24, GigabitEthernet 0/1
21-RSR20-1(config-router)#
```

有 2 条 R 条目。通过向 R2 和交换机学习，产生动态路由，目标网段分别为 192.168.3.0 和 192.168.5.0，下一条地址分别为 192.168.2.2 和 192.168.1.2，出站接口分别为串口 2/0，以太网口 0/1。

分析交换机 R2 的路由表，表中有 R 条目吗？是怎样产生的？

```
21-RSR20-2(config)#show ip route

Codes:  C - connected, S - static, R - RIP, B - BGP
        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

Gateway of last resort is no set
R    192.168.1.0/24 [120/1] via 192.168.2.1, 00:00:52, Serial 2/0
C    192.168.2.0/24 is directly connected, Serial 2/0
C    192.168.2.2/32 is local host.
C    192.168.3.0/24 is directly connected, GigabitEthernet 0/1
C    192.168.3.1/32 is local host.
R    192.168.5.0/24 [120/2] via 192.168.2.1, 00:00:52, Serial 2/0
```

有 2 条 R 条目。通过向 R1 和交换机学习，产生动态路由，目标网段分别为 192.168.1.0 和 192.168.5.0，

下一条地址均为 192.168.2.1，出站接口均为串口 2/0。

8）测试网络的连通性

①将此时的路由表与步骤一的路由表进行比较，有什么结论？

步骤一时路由器表中并没有 R 条目，而此时路由器有两条动态路由的标识 R，

这是通过学习得来的。

```
21-RSR20-1(config-router)#show ip route

Codes:  C - connected, S - static, R - RIP, B - BGP
        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

Gateway of last resort is no set
C    192.168.1.0/24 is directly connected, GigabitEthernet 0/1
C    192.168.1.1/32 is local host.
C    192.168.2.0/24 is directly connected, Serial 2/0
C    192.168.2.1/32 is local host.
R    192.168.3.0/24 [120/1] via 192.168.2.2, 00:01:27, Serial 2/0
R    192.168.5.0/24 [120/1] via 192.168.1.2, 00:02:24, GigabitEthernet 0/1
21-RSR20-1(config-router)#
```

```
21-RSR20-2(config)#show ip route

Codes:  C - connected, S - static, R - RIP, B - BGP
        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

Gateway of last resort is no set
R    192.168.1.0/24 [120/1] via 192.168.2.1, 00:00:52, Serial 2/0
C    192.168.2.0/24 is directly connected, Serial 2/0
C    192.168.2.2/32 is local host.
C    192.168.3.0/24 is directly connected, GigabitEthernet 0/1
C    192.168.3.1/32 is local host.
R    192.168.5.0/24 [120/2] via 192.168.2.1, 00:00:52, Serial 2/0
```

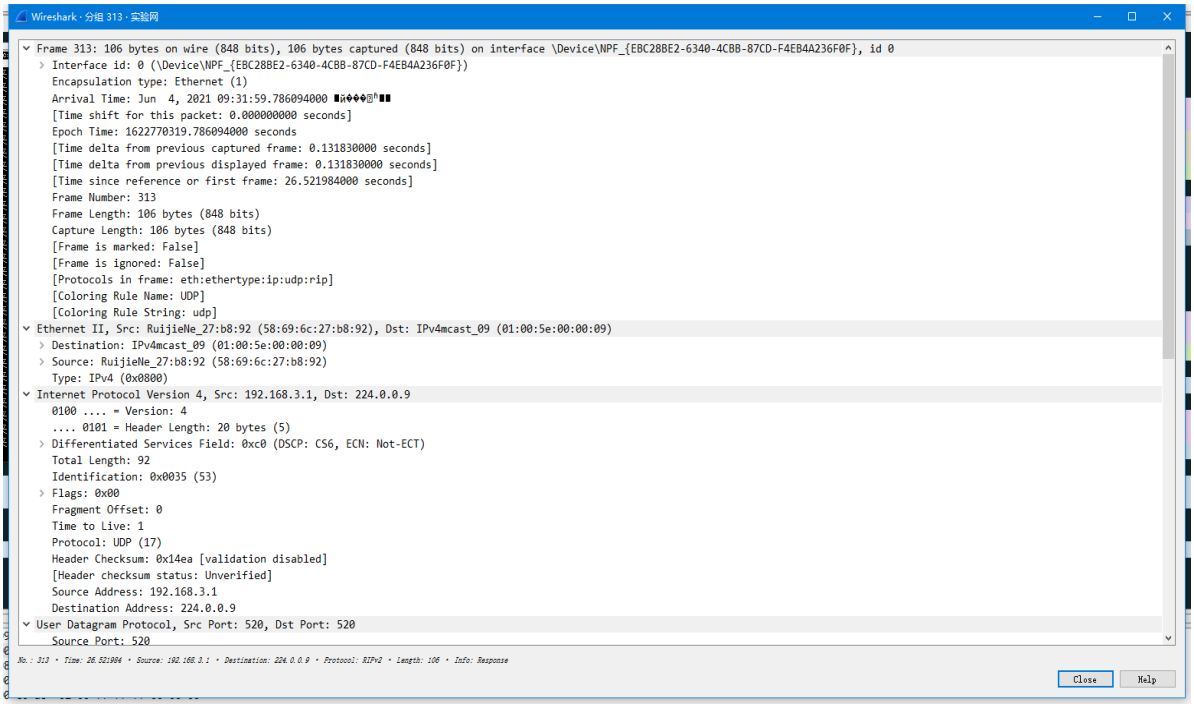
②分析 traceroute PC1 的结果

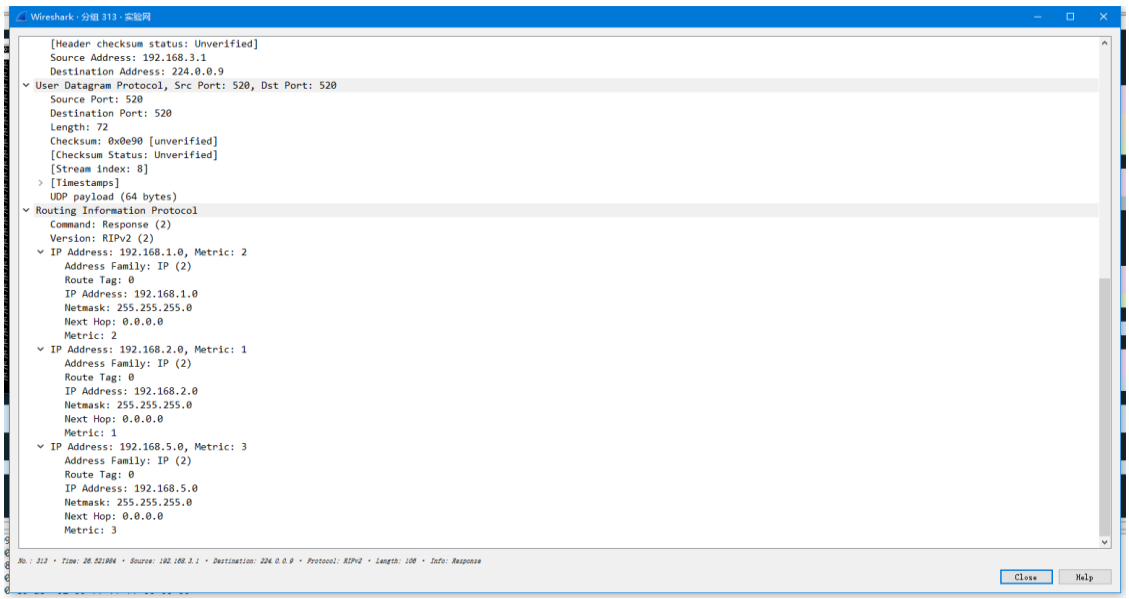
```
C:\Users\Administrator>tracert 192.168.5.11

通过最多 30 个跃点跟踪到 192.168.5.11 的路由

  1    <1 毫秒    <1 毫秒    <1 毫秒 192.168.3.1
  2    44 ms     42 ms     41 ms  192.168.2.1
  3    48 ms     50 ms     50 ms  192.168.1.2
  4    45 ms     45 ms     46 ms  192.168.5.11

跟踪完成。
```

IP 数据报通过虚拟接口 192.168.3.1 到达交换机，再通过端口 192.168.2.1
使 R1 转发数据包，经过端口 192.168.1.2 到达 R2，最后到达目标主机 192.168.5.11。
③进行拔线实验，通过 Wireshark 测试报文变化的时间差，路由有没有出现毒性反转现象？
出现了毒性反转现象。

75 34.071612	192.168.5.11	192.168.3.22	ICMP	74	Echo (ping) request id=0x0001, seq=36/9216, ttl=64 (no response found!)
79 39.001488	192.168.5.11	192.168.3.22	ICMP	74	Echo (ping) request id=0x0001, seq=37/9472, ttl=64 (no response found!)
80 39.035189	192.168.2.2	192.168.5.11	ICMP	70	Destination unreachable (Network unreachable)
82 40.005795	192.168.5.11	192.168.3.22	ICMP	74	Echo (ping) request id=0x0001, seq=38/9728, ttl=64 (no response found!)
83 40.005879	192.168.10.1	192.168.5.11	ICMP	70	Destination unreachable (Network unreachable)
88 41.009655	192.168.5.11	192.168.3.22	ICMP	74	Echo (ping) request id=0x0001, seq=39/9984, ttl=64 (no response found!)
89 41.009745	192.168.10.1	192.168.5.11	ICMP	70	Destination unreachable (Network unreachable)
90 42.013657	192.168.5.11	192.168.3.22	ICMP	74	Echo (ping) request id=0x0001, seq=40/10240, ttl=64 (no response found!)
91 42.013738	192.168.10.1	192.168.5.11	ICMP	70	Destination unreachable (Network unreachable)
94 43.016984	192.168.5.11	192.168.3.22	ICMP	74	Echo (ping) request id=0x0001, seq=41/10496, ttl=64 (no response found!)
95 43.017063	192.168.10.1	192.168.5.11	ICMP	70	Destination unreachable (Network unreachable)
99 44.020596	192.168.5.11	192.168.3.22	ICMP	74	Echo (ping) request id=0x0001, seq=42/10752, ttl=64 (no response found!)
107 49.002234	192.168.5.11	192.168.3.22	ICMP	74	Echo (ping) request id=0x0001, seq=43/11008, ttl=64 (no response found!)
112 54.001976	192.168.5.11	192.168.3.22	ICMP	74	Echo (ping) request id=0x0001, seq=44/11264, ttl=64 (no response found!)

将 PC2 从网络中移除，使 PC2 不可达。使用 PC1pingPC2，在 wireshark 上查看捕获到的数据包，可以看到路由器 2 首先报告目标不可达，然后路由器 1 报告目标不可达，表明路由出现了毒性反转。
④捕获数据包，分析 RIP 封装结构，RIP 包在 PC1 或 PC2 上能捕获到吗？
RIP 包在 PC1 和 PC2 上都能捕获到






```
Frame 76: 110 bytes on wire (880 bits), 110 bytes captured (880 bits) on interface \Device\NPF_{F79B1DFF-B47D-45C5-8AFD-605A02562A6C}, id 0
    Interface id: 0 (\Device\NPF_{F79B1DFF-B47D-45C5-8AFD-605A02562A6C})
    Encapsulation type: Ethernet (1)
    Arrival Time: Jun  4, 2021 09:34:56.149622000 ■ñ◆◆◆⊡ⁿ■■
    [Time shift for this packet: 0.000000000 seconds]
    Epoch Time: 1622770496.149622000 seconds
    [Time delta from previous captured frame: 0.001970000 seconds]
    [Time delta from previous displayed frame: 0.001970000 seconds]
    [Time since reference or first frame: 17.832936000 seconds]
    Frame Number: 76
    Frame Length: 110 bytes (880 bits)
    Capture Length: 110 bytes (880 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:udp:rip]
    [Coloring Rule Name: UDP]
    [Coloring Rule String: udp]
Ethernet II, Src: RuijieNe_77:14:73 (14:14:4b:77:14:73), Dst: IPv4mcast_09 (01:00:5e:00:00:09)
    Destination: IPv4mcast_09 (01:00:5e:00:00:09)
    Source: RuijieNe_77:14:73 (14:14:4b:77:14:73)
    Type: IPv4 (0x0800)
    Frame check sequence: 0xac817ff5 [unverified]
    [FCS Status: Unverified]
Internet Protocol Version 4, Src: 192.168.5.1, Dst: 224.0.0.9
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0xc0 (DSCP: CS6, ECN: Not-ECT)
    Total Length: 92
    Identification: 0x0051 (81)
    Flags: 0x00
    Fragment Offset: 0
    Time to Live: 1
    Protocol: UDP (17)
    Header Checksum: 0x12ce [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 192.168.5.1
    Destination Address: 224.0.0.9
User Datagram Protocol, Src Port: 520, Dst Port: 520
    Source Port: 520
    Destination Port: 520
    Length: 72
    Checksum: 0x0e90 [unverified]
    [Checksum Status: Unverified]
    [Stream index: 4]
    [Timestamps]
    UDP payload (64 bytes)
```

实验思考：

①查看交换机端口 0/1 所属的 VLAN 应使用哪条命令？

show vlan

②如何查看 RIP 的版本号和发布到的网段？

show ip protocal

③RIPv1 的广播地址是什么？RIPv2 的组播地址是什么？

ripv1 广播地址：255.255.255.255

ripv2 组播地址：224.0.0.9

④使用 10.10.X.0 的 IP 地址重做本次试验，注意网段间使用不同的子网掩码。当在 RIPv1 下设置不同网段时，配置后的端口实际上获得的子网掩码是什么？配合实验分析原因。

通过实验可以得出，由于 RIPv2 支持 VLSM，并且以组播的形式进行路由更新，所以在路由器 1 上的 PC 获得的子网掩码为 25.

⑤RIPv1 必须使用自动汇总，不支持不连续网络，请实验验证。RIPv2 支持不连续网络吗？

RIPv2 支持不连续网络。

⑥RIPv1 对路由没有标记的功能，RIPv2 可以对路由打标记（tag），用于过滤和做策略。请在实验中观察和分析。

可以在 debug ip rip 中可以观察到例如下图样式的 tag 标记，在后面指出了 ip 地址以及子网掩码，下一跳路由器地址以及到网络的距离。

```
[RIP] Building update entries on GigabitEthernet 0/1
      192.168.1.0/24 via 0.0.0.0 metric 2 tag 0
      192.168.2.0/24 via 0.0.0.0 metric 1 tag 0
      192.168.5.0/24 via 0.0.0.0 metric 3 tag 0
```

2. 通过实验观察 RIP V1 和 V2 的区别（重点在 VLSM 上）给出分析过程与结果（实验 IP 采用 10.10.x.0 网段）

PC1 IP 地址为 10.10.5.11/17，默认网关为 10.10.5.1

PC2 IP 地址为 10.10.3.22/24，默认网关为 10.10.3.1

1）对交换机进行配置

```
28-s5750-1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
28-s5750-1(config)#hostname s5750
s5750(config)#vlan 10
s5750(config-vlan)#exit
s5750(config)#vlan 50
s5750(config-vlan)#exit
s5750(config)#interface gigabitethernet 0/1
s5750(config-if-GigabitEthernet 0/1)#switchport access vlan 10
s5750(config-if-GigabitEthernet 0/1)#exit
s5750(config)#interface gigabitethernet 0/5
s5750(config-if-GigabitEthernet 0/5)#switchport access vlan 50
s5750(config-if-GigabitEthernet 0/5)#exit
```

```
5750(config)#vlan 10
5750(config-vlan)#exit
5750(config)#interface vlan 10
5750(config-if-VLAN 10)#no ip address
5750(config-if-VLAN 10)#ip address 10.10.1.2 255.255.255.0
5750(config-if-VLAN 10)#exit
5750(config)#interface vlan 50
5750(config-if-VLAN 50)#ip address 10.10.128.1 255.255.128.0
5750(config-if-VLAN 50)#exit
5750(config)#
```

2）对路由器 R1 进行配置

```
Ruijie#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)#interface gigabitethernet 0/1
Ruijie(config-if-GigabitEthernet 0/1)#ip address 10.10.1.1 255.255.255.0
Ruijie(config-if-GigabitEthernet 0/1)#no shutdown
Ruijie(config-if-GigabitEthernet 0/1)#exit
Ruijie(config)#interface serial 2/0
Ruijie(config-if-Serial 2/0)#ip address 10.10.2.1 255.255.255.0
Ruijie(config-if-Serial 2/0)#no shutdown
Ruijie(config-if-Serial 2/0)#
```

3）对路由器 R2 进行配置

```
Router2(config)#interface gigabitethernet 0/1
Router2(config-if-GigabitEthernet 0/1)#ip addrsss 10.10.3.1 255.255.255.0
                                      ^
% Invalid input detected at '^' marker.

Router2(config-if-GigabitEthernet 0/1)#ip address 10.10.3.1 255.255.255.0
Router2(config-if-GigabitEthernet 0/1)#no shutdown
Router2(config-if-GigabitEthernet 0/1)#exit
Router2(config)#interface serial 2/0
Router2(config-if-Serial 2/0)#ip address 10.10.2.2 255.255.255.0
Router2(config-if-Serial 2/0)#no shutdown
Router2(config-if-Serial 2/0)#exit
Router2(config)#
```

4）交换机配置 RIPv1 路由协议

```
s5750(config)#route rip
s5750(config-router)#version 1
s5750(config-router)#network 10.10.1.0 255.255.255.0
s5750(config-router)#network 10.10.5.0 255.255.255.0
s5750(config-router)#
```

5）路由器 R1 配置 RIPv1 路由协议

```
21-RSR20-1(config-if-Serial 2/0)#route rip
21-RSR20-1(config-router)#version 1
21-RSR20-1(config-router)#no auto-summary
21-RSR20-1(config-router)#network 10.10.1.0 255.255.255.0
21-RSR20-1(config-router)#network 10.10.2.0 255.255.255.0
21-RSR20-1(config-router)#
```

6）路由器 R2 配置 RIPv1 路由协议

```
21-RSR20-2(config)#router rip
21-RSR20-2(config-router)#version 1
21-RSR20-2(config-router)#no auto-summary
21-RSR20-2(config-router)#network 10.10.2.0 255.255.255.0
21-RSR20-2(config-router)#network 10.10.3.0 255.255.255.0
21-RSR20-2(config-router)#
```

7）查看交换机路由表

```
s5750(config-router)#show ip route

Codes:  C - connected, S - static, R - RIP, B - BGP
        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

Gateway of last resort is no set
C    10.10.1.0/24 is directly connected, VLAN 10
C    10.10.1.2/32 is local host.
R    10.10.2.0/24 [120/1] via 10.10.1.1, 00:01:14, VLAN 10
R    10.10.3.0/24 [120/2] via 10.10.1.1, 00:00:15, VLAN 10
C    10.10.5.0/24 is directly connected, VLAN 50
C    10.10.5.1/32 is local host.
```

8）查看路由器 R1 交换表

```
21-RSR20-1(config-router)#show ip route

Codes:  C - connected, S - static, R - RIP, B - BGP
        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

Gateway of last resort is no set
C    10.10.1.0/24 is directly connected, GigabitEthernet 0/1
C    10.10.1.1/32 is local host.
C    10.10.2.0/24 is directly connected, Serial 2/0
C    10.10.2.1/32 is local host.
R    10.10.3.0/24 [120/1] via 10.10.2.2, 00:00:41, Serial 2/0
R    10.10.5.0/24 [120/1] via 10.10.1.2, 00:01:52, GigabitEthernet 0/1
21-RSR20-1(config-router)#
```

10.10.5.0 的子网掩码不是 17 位而是 24 位，说明发生了自动汇总

9）查看路由器 R2 交换表

```
21-RSR20-2(config)#show ip route

Codes:  C - connected, S - static, R - RIP, B - BGP
        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

Gateway of last resort is no set
R    10.10.1.0/24 [120/1] via 10.10.2.1, 00:00:32, Serial 2/0
C    10.10.2.0/24 is directly connected, Serial 2/0
C    10.10.2.2/32 is local host.
C    10.10.3.0/24 is directly connected, GigabitEthernet 0/1
C    10.10.3.1/32 is local host.
R    10.10.5.0/24 [120/2] via 10.10.2.1, 00:00:32, Serial 2/0
21-RSR20-2(config)#
```

10.10.5.0 的子网掩码不是 17 位而是 24 位，说明发生了自动汇总

10）检查连通性

```
C:\Users\Administrator>ping 10.10.5.11

正在 Ping 10.10.5.11 具有 32 字节的数据:
来自 10.10.5.11 的回复: 字节=32 时间=39ms TTL=61
来自 10.10.5.11 的回复: 字节=32 时间=40ms TTL=61
来自 10.10.5.11 的回复: 字节=32 时间=40ms TTL=61
来自 10.10.5.11 的回复: 字节=32 时间=39ms TTL=61

10.10.5.11 的 Ping 统计信息:
    数据包: 已发送 = 4, 已接收 = 4, 丢失 = 0 (0% 丢失),
往返行程的估计时间(以毫秒为单位):
    最短 = 39ms, 最长 = 40ms, 平均 = 39ms
```

11）分析 RIPv1 与 RIPv2 路由协议的区别

35	18.011075	10.10.3.1	224.0.0.9	RIPv2	90	Response
38	19.871200	10.10.3.1	224.0.0.9	RIPv2	110	Response
53	29.010799	10.10.3.1	224.0.0.9	RIPv2	90	Response
98	49.870097	10.10.3.1	224.0.0.9	RIPv2	110	Response
189	79.869314	10.10.3.1	224.0.0.9	RIPv2	110	Response
258	109.868406	10.10.3.1	255.255.255.255	RIPv1	110	Response
274	115.938013	10.10.3.1	255.255.255.255	RIPv1	70	Response
311	139.867448	10.10.3.1	255.255.255.255	RIPv1	130	Response

可以看到 RIPv2 使用 ip 地址 224.0.0.9 进行组播，RIPv1 在本网络内进行广播

RIPv1 包详情:

```
> Frame 258: 110 bytes on wire (880 bits), 110 bytes captured (880 bits) on interface \Devic
> Ethernet II, Src: RuijieNe_47:26:d6 (80:05:88:47:26:d6), Dst: Broadcast (ff:ff:ff:ff:ff:ff
v Internet Protocol Version 4, Src: 10.10.3.1, Dst: 255.255.255.255
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0xc0 (DSCP: CS6, ECN: Not-ECT)
    Total Length: 92
    Identification: 0x008a (138)
  > Flags: 0x00
    Fragment Offset: 0
    Time to Live: 64
    Protocol: UDP (17)
    Header Checksum: 0x6c3d [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 10.10.3.1
    Destination Address: 255.255.255.255
v User Datagram Protocol, Src Port: 520, Dst Port: 520
    Source Port: 520
    Destination Port: 520
    Length: 72
    Checksum: 0x4b18 [unverified]
    [Checksum Status: Unverified]
    [Stream index: 6]
  > [Timestamps]
    UDP payload (64 bytes)
> Routing Information Protocol
```

RIPv2 包详情:

```
Frame 53: 90 bytes on wire (720 bits), 90 bytes captured (720 bits) on interface \Device\NP
  Interface id: 0 (\Device\NPF_{F79B1DFF-B47D-45C5-8AFD-605A02562A6C})
  Encapsulation type: Ethernet (1)
  Arrival Time: May 28, 2021 09:25:36.730213000 ■ú◆◆◆□ª■■
  [Time shift for this packet: 0.000000000 seconds]
  Epoch Time: 1622165136.730213000 seconds
  [Time delta from previous captured frame: 4.301736000 seconds]
  [Time delta from previous displayed frame: 9.139599000 seconds]
  [Time since reference or first frame: 29.010799000 seconds]
  Frame Number: 53
  Frame Length: 90 bytes (720 bits)
  Capture Length: 90 bytes (720 bits)
  [Frame is marked: False]
  [Frame is ignored: False]
  [Protocols in frame: eth:ethertype:ip:udp:rip]
  [Coloring Rule Name: UDP]
  [Coloring Rule String: udp]
Ethernet II, Src: RuijieNe_47:26:d6 (80:05:88:47:26:d6), Dst: IPv4mcast_09 (01:00:5e:00:00:
  Destination: IPv4mcast_09 (01:00:5e:00:00:09)
  Source: RuijieNe_47:26:d6 (80:05:88:47:26:d6)
  Type: IPv4 (0x0800)
  Frame check sequence: 0x36fb35e7 [unverified]
  [FCS Status: Unverified]
Internet Protocol Version 4, Src: 10.10.3.1, Dst: 224.0.0.9
  0100 .... = Version: 4
  .... 0101 = Header Length: 20 bytes (5)
  Differentiated Services Field: 0xc0 (DSCP: CS6, ECN: Not-ECT)
```

RIPv1 是有类路由协议，RIPv2 是无类路由协议；RIPv1 不能支持 VLSM，RIPv2 可以支持 VLSM；RIPv1 是广播更新，RIPv2 是组播更新。

3. 学会使用 Debug ip packet 和 Debug ip rip 命令，并对 debug 信息做分析。

在路由器 R2 上进行 Debug ip packet：

```
21-RSR20-2#debug ip packet
21-RSR20-2#*Jun  4 08:21:50: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),le
n=1468,received
*Jun  4 08:21:58: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:22:00: %7: IP: s=192.168.2.1 (Serial 2/0), d=224.0.0.9,vrf=global(0),len=72,received
*Jun  4 08:22:05: %7: IP: s=192.168.2.2 (local), d=224.0.0.9 (Serial 2/0),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer
222
*Jun  4 08:22:07: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:22:14: %7: IP: s=192.168.3.1 (local), d=224.0.0.9 (GigabitEthernet 0/1),vrf=global(0), g=224.0.0.9,len=92,sent ip pkt to lin
k_layer --> raw send
*Jun  4 08:22:15: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:22:24: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:22:30: %7: IP: s=192.168.2.1 (Serial 2/0), d=224.0.0.9,vrf=global(0),len=72,received
*Jun  4 08:22:32: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:22:35: %7: IP: s=192.168.2.2 (local), d=224.0.0.9 (Serial 2/0),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer
222
*Jun  4 08:22:41: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:22:44: %7: IP: s=192.168.3.1 (local), d=224.0.0.9 (GigabitEthernet 0/1),vrf=global(0), g=224.0.0.9,len=92,sent ip pkt to lin
k_layer --> raw send
*Jun  4 08:22:50: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:22:58: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:23:00: %7: IP: s=192.168.2.1 (Serial 2/0), d=224.0.0.9,vrf=global(0),len=72,received
*Jun  4 08:23:05: %7: IP: s=192.168.2.2 (local), d=224.0.0.9 (Serial 2/0),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer
222
*Jun  4 08:23:07: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:23:14: %7: IP: s=192.168.3.1 (local), d=224.0.0.9 (GigabitEthernet 0/1),vrf=global(0), g=224.0.0.9,len=92,sent ip pkt to lin
k_layer --> raw send
*Jun  4 08:23:15: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:23:24: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:23:30: %7: IP: s=192.168.2.1 (Serial 2/0), d=224.0.0.9,vrf=global(0),len=72,received
*Jun  4 08:23:32: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:23:35: %7: IP: s=192.168.2.2 (local), d=224.0.0.9 (Serial 2/0),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer
222
```

从上图可以看出，端口地址是 R 显示的 192.168.2.2，接收的数据包长度为 52，g=224.0.0.9，以组播的形式发送更新报文，说明是 V2。

发送数据包时，数据包目标地址是 192.168.2.1，发送数据包的长度为 72

在路由器 R2 上进行 Debug ip rip：

```
21-RSR20-2#debug ip rip
21-RSR20-2#*Jun  4 08:26:30: %7: [RIP] RIP recveived packet, sock=32979 src=192.168.2.1 len=44
*Jun  4 08:26:30: %7:  [RIP] Received version 2 response packet on Serial 2/0
*Jun  4 08:26:30: %7:  [RIP] Cancel peer[192.168.2.1] remove timer
*Jun  4 08:26:30: %7:  [RIP] Peer[192.168.2.1] remove timer shedule...
*Jun  4 08:26:30: %7:  [RIP] Both do not need auth, Auth ok
*Jun  4 08:26:30: %7:        route-entry: family 2 tag 0 ip 192.168.1.0 mask 255.255.255.0 nhop 0.0.0.0 metric 1
*Jun  4 08:26:30: %7:        route-entry: family 2 tag 0 ip 192.168.5.0 mask 255.255.255.0 nhop 0.0.0.0 metric 2
*Jun  4 08:26:30: %7:  [RIP] [192.168.1.0/24] RIP route update, protocol(4)
*Jun  4 08:26:30: %7:  [RIP] Old path is: nhop=192.168.2.1 routesrc=192.168.2.1 intf=2
*Jun  4 08:26:30: %7:  [RIP] New path is: nhop=192.168.2.1 routesrc=192.168.2.1 intf=2
*Jun  4 08:26:30: %7:  [RIP] [192.168.1.0/24] RIP distance apply from 192.168.2.1!
*Jun  4 08:26:30: %7:  [RIP] [192.168.1.0/24] cancel Route timer
*Jun  4 08:26:30: %7:  [RIP] [192.168.1.0/24] route timer schedule...
*Jun  4 08:26:30: %7:  [RIP] [192.168.5.0/24] RIP route update, protocol(4)
*Jun  4 08:26:30: %7:  [RIP] Old path is: nhop=192.168.2.1 routesrc=192.168.2.1 intf=2
*Jun  4 08:26:30: %7:  [RIP] New path is: nhop=192.168.2.1 routesrc=192.168.2.1 intf=2
*Jun  4 08:26:30: %7:  [RIP] [192.168.5.0/24] RIP distance apply from 192.168.2.1!
*Jun  4 08:26:30: %7:  [RIP] [192.168.5.0/24] cancel Route timer
*Jun  4 08:26:30: %7:  [RIP] [192.168.5.0/24] route timer schedule...
*Jun  4 08:26:35: %7:  [RIP] Update timer expired via interface Serial 2/0[192.168.2.2/24]
*Jun  4 08:26:35: %7:  [RIP] Update timer schedule via interface Serial 2/0[192.168.2.2/24]
*Jun  4 08:26:35: %7:  [RIP] Prepare to send MULTICAST response...
*Jun  4 08:26:35: %7:  [RIP] Building update entries on Serial 2/0
*Jun  4 08:26:35: %7:        192.168.3.0/24 via 0.0.0.0 metric 1 tag 0
*Jun  4 08:26:35: %7:  [RIP] Send packet to 224.0.0.9 Port 520 on Serial 2/0
*Jun  4 08:26:38: %7:  [RIP] Update timer expired via interface GigabitEthernet 0/1[192.168.3.1/24]
*Jun  4 08:26:38: %7:  [RIP] Update timer schedule via interface GigabitEthernet 0/1[192.168.3.1/24]
*Jun  4 08:26:38: %7:  [RIP] Prepare to send MULTICAST response...
*Jun  4 08:26:38: %7:  [RIP] Building update entries on GigabitEthernet 0/1
*Jun  4 08:26:38: %7:        192.168.1.0/24 via 0.0.0.0 metric 2 tag 0
*Jun  4 08:26:38: %7:        192.168.2.0/24 via 0.0.0.0 metric 1 tag 0
*Jun  4 08:26:38: %7:        192.168.5.0/24 via 0.0.0.0 metric 3 tag 0
*Jun  4 08:26:38: %7:  [RIP] Send packet to 224.0.0.9 Port 520 on GigabitEthernet 0/1
*Jun  4 08:27:00: %7: [RIP] RIP recveived packet, sock=32979 src=192.168.2.1 len=44
*Jun  4 08:27:00: %7:  [RIP] Received version 2 response packet on Serial 2/0
*Jun  4 08:27:00: %7:  [RIP] Cancel peer[192.168.2.1] remove timer
*Jun  4 08:27:00: %7:  [RIP] Peer[192.168.2.1] remove timer shedule...
*Jun  4 08:27:00: %7:  [RIP] Both do not need auth, Auth ok
*Jun  4 08:27:00: %7:        route-entry: family 2 tag 0 ip 192.168.1.0 mask 255.255.255.0 nhop 0.0.0.0 metric 1
*Jun  4 08:27:00: %7:        route-entry: family 2 tag 0 ip 192.168.5.0 mask 255.255.255.0 nhop 0.0.0.0 metric 2
*Jun  4 08:27:00: %7:  [RIP] [192.168.1.0/24] RIP route update, protocol(4)
*Jun  4 08:27:00: %7:  [RIP] Old path is: nhop=192.168.2.1 routesrc=192.168.2.1 intf=2
*Jun  4 08:27:00: %7:  [RIP] New path is: nhop=192.168.2.1 routesrc=192.168.2.1 intf=2
*Jun  4 08:27:00: %7:  [RIP] [192.168.1.0/24] RIP distance apply from 192.168.2.1!
*Jun  4 08:27:00: %7:  [RIP] [192.168.1.0/24] cancel Route timer
*Jun  4 08:27:00: %7:  [RIP] [192.168.1.0/24] route timer schedule...
*Jun  4 08:27:00: %7:  [RIP] [192.168.5.0/24] RIP route update, protocol(4)
*Jun  4 08:27:00: %7:  [RIP] Old path is: nhop=192.168.2.1 routesrc=192.168.2.1 intf=2
*Jun  4 08:27:00: %7:  [RIP] New path is: nhop=192.168.2.1 routesrc=192.168.2.1 intf=2
*Jun  4 08:27:00: %7:  [RIP] [192.168.5.0/24] RIP distance apply from 192.168.2.1!
*Jun  4 08:27:00: %7:  [RIP] [192.168.5.0/24] cancel Route timer
*Jun  4 08:27:00: %7:  [RIP] [192.168.5.0/24] route timer schedule...
*Jun  4 08:27:05: %7:  [RIP] Update timer expired via interface Serial 2/0[192.168.2.2/24]
*Jun  4 08:27:05: %7:  [RIP] Update timer schedule via interface Serial 2/0[192.168.2.2/24]
*Jun  4 08:27:05: %7:  [RIP] Prepare to send MULTICAST response...
```

从上图可以看出，从 192.168.1.1 发送组播报文，然后该组播报文由 192.168.2.1 端口继续转发，最后 192.168.2.1 端口收到了该报文，并发送回复了信息，回复信息中包含了 RIP 版本信息。还可以看到对目标子网 192.168.5.0/24，从 192.168.2.1 出发的路由信息更新过程。

4. 观察试验拓扑中链路状态发生改变时路由表的前后信息对比及 debug 信息的变化。

将路由器 1 与交换机之间相连的线拔掉，以此来改变拓扑中的链路状态

交换机的路由表：

路由表中已经没有 RIP，说明交换机已经与路由器断开

```
s5750(config)#show ip route

Codes:  C - connected, S - static, R - RIP, B - BGP
        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

Gateway of last resort is no set
C    192.168.5.0/24 is directly connected, VLAN 50
C    192.168.5.1/32 is local host.
s5750(config)#
```

路由器 R1 的路由表：

路由器 R1 中已经没有与 192.168.5.0 的 RIP 连接

```
21-RSR20-1(config)#show ip route

Codes:  C - connected, S - static, R - RIP, B - BGP
        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

Gateway of last resort is no set
C    192.168.1.0/24 is directly connected, GigabitEthernet 0/1
C    192.168.1.1/32 is local host.
C    192.168.2.0/24 is directly connected, Serial 2/0
C    192.168.2.1/32 is local host.
R    192.168.3.0/24 [120/1] via 192.168.2.2, 00:04:31, Serial 2/0
21-RSR20-1(config)#
```

路由器 R2 的路由表：

路由器 R2 中已经没有与 192.168.1.0 和 192.168.5.0 的 RIP 连接

```
21-RSR20-2(config)#show ip route

Codes:  C - connected, S - static, R - RIP, B - BGP
        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

Gateway of last resort is no set
C    192.168.2.0/24 is directly connected, Serial 2/0
C    192.168.2.2/32 is local host.
C    192.168.3.0/24 is directly connected, GigabitEthernet 0/1
C    192.168.3.1/32 is local host.
```

在路由器 R2 上进行 debug ip packet：

```
21-RSR20-2#debug ip packet
21-RSR20-2#*Jun  4 08:33:55: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:33:59: %7: IP: s=192.168.3.1 (local), d=224.0.0.9 (GigabitEthernet 0/1),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer --> raw send
*Jun  4 08:34:04: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:34:05: %7: IP: s=192.168.2.2 (local), d=224.0.0.9 (Serial 2/0),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer  222
*Jun  4 08:34:12: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:34:21: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:34:29: %7: IP: s=192.168.3.1 (local), d=224.0.0.9 (GigabitEthernet 0/1),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer --> raw send
*Jun  4 08:34:29: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:34:35: %7: IP: s=192.168.2.2 (local), d=224.0.0.9 (Serial 2/0),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer  222
*Jun  4 08:34:38: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:34:46: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:34:55: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:34:59: %7: IP: s=192.168.3.1 (local), d=224.0.0.9 (GigabitEthernet 0/1),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer --> raw send
*Jun  4 08:35:03: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:35:05: %7: IP: s=192.168.2.2 (local), d=224.0.0.9 (Serial 2/0),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer  222
*Jun  4 08:35:12: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:35:20: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:35:29: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:35:29: %7: IP: s=192.168.3.1 (local), d=224.0.0.9 (GigabitEthernet 0/1),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer --> raw send
*Jun  4 08:35:35: %7: IP: s=192.168.2.2 (local), d=224.0.0.9 (Serial 2/0),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer  222
*Jun  4 08:35:37: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:35:46: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:35:54: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:35:59: %7: IP: s=192.168.3.1 (local), d=224.0.0.9 (GigabitEthernet 0/1),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer --> raw send
*Jun  4 08:36:03: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:36:05: %7: IP: s=192.168.2.2 (local), d=224.0.0.9 (Serial 2/0),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer  222
*Jun  4 08:36:11: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:36:20: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:36:29: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:36:29: %7: IP: s=192.168.3.1 (local), d=224.0.0.9 (GigabitEthernet 0/1),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer --> raw send
*Jun  4 08:36:35: %7: IP: s=192.168.2.2 (local), d=224.0.0.9 (Serial 2/0),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer  222
*Jun  4 08:36:37: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:36:46: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:36:54: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:36:59: %7: IP: s=192.168.3.1 (local), d=224.0.0.9 (GigabitEthernet 0/1),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer --> raw send
*Jun  4 08:37:03: %7: IP: s=192.168.3.22 (GigabitEthernet 0/1), d=192.168.3.255,vrf=global(0),len=1468,received
*Jun  4 08:37:05: %7: IP: s=192.168.2.2 (local), d=224.0.0.9 (Serial 2/0),vrf=global(0), g=224.0.0.9,len=52,sent ip pkt to link_layer  222
```

可以看到，本地端口在不停地发送报文，但是与路由器 R1 相连的 192.168.2.1 端口没有接受过报文

在路由器 R2 上进行 debug ip rip：

```
21-RSR20-2#debug ip rip
21-RSR20-2#*Jun  4 08:38:27: %7:  [RIP] Update timer expired via interface GigabitEthernet 0/1[192.168.3.1/24]
*Jun  4 08:38:27: %7:  [RIP] Update timer schedule via interface GigabitEthernet 0/1[192.168.3.1/24]
*Jun  4 08:38:27: %7:  [RIP] Prepare to send MULTICAST response...
*Jun  4 08:38:27: %7:  [RIP] Building update entries on GigabitEthernet 0/1
*Jun  4 08:38:27: %7:        192.168.2.0/24 via 0.0.0.0 metric 1 tag 0
*Jun  4 08:38:27: %7:  [RIP] Send packet to 224.0.0.9 Port 520 on GigabitEthernet 0/1
*Jun  4 08:38:35: %7:  [RIP] Update timer expired via interface Serial 2/0[192.168.2.2/24]
*Jun  4 08:38:35: %7:  [RIP] Update timer schedule via interface Serial 2/0[192.168.2.2/24]
*Jun  4 08:38:35: %7:  [RIP] Prepare to send MULTICAST response...
*Jun  4 08:38:35: %7:  [RIP] Building update entries on Serial 2/0
*Jun  4 08:38:35: %7:        192.168.3.0/24 via 0.0.0.0 metric 1 tag 0
*Jun  4 08:38:35: %7:  [RIP] Send packet to 224.0.0.9 Port 520 on Serial 2/0
*Jun  4 08:38:57: %7:  [RIP] Update timer expired via interface GigabitEthernet 0/1[192.168.3.1/24]
*Jun  4 08:38:57: %7:  [RIP] Update timer schedule via interface GigabitEthernet 0/1[192.168.3.1/24]
*Jun  4 08:38:57: %7:  [RIP] Prepare to send MULTICAST response...
*Jun  4 08:38:57: %7:  [RIP] Building update entries on GigabitEthernet 0/1
*Jun  4 08:38:57: %7:        192.168.2.0/24 via 0.0.0.0 metric 1 tag 0
*Jun  4 08:38:57: %7:  [RIP] Send packet to 224.0.0.9 Port 520 on GigabitEthernet 0/1
```

在实验的过程中发现，此时显示的 rip 路由接收和发送的更新信息速度明显慢了很多，而且信息也少了很多。

本次实验完成后，请根据组员在实验中的贡献，请实事求是，自评在实验中应得的分数。（按百分制）

学号	学生	自评分
19335118	梁冠轩	100
19335258	余世龙	100

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