【实验题目】OSPF 配置实验

【实验目的】掌握 OSPF 协议单区域配置方法。

【实验内容】

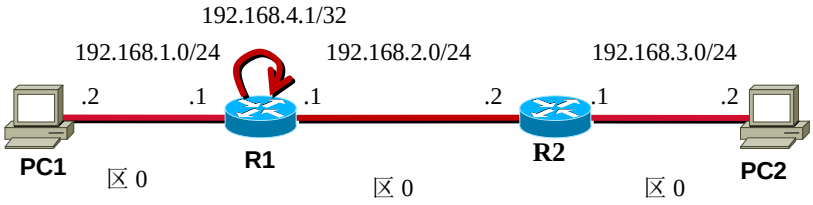
** 下面路由器均启动 OSPF 协议。实验结果和分析直接记录在下面每一个步骤后面。

** Loopback 网位于区 0。

** 命令#relaod 可以通过重启路由器。

** Loopback 接口的名：loopback num （num 为编号，可以任意取）

1、按下图配置两台路由器为 OSPF 协议。



注意：中间采用以太网连接，要 shutdown 原来的串行接口。

[1A、连通后截屏 PC1 ping PC2 的结果。]

如下图所示，PC1 可以正常 ping 通 PC2。

```
PS C:\Users\Administrator> ping 192.168.3.2

正在 Ping 192.168.3.2 具有 32 字节的数据:
来自 192.168.3.2 的回复: 字节=32 时间=7ms TTL=126
来自 192.168.3.2 的回复: 字节=32 时间<1ms TTL=126
来自 192.168.3.2 的回复: 字节=32 时间<1ms TTL=126
来自 192.168.3.2 的回复: 字节=32 时间<1ms TTL=126

192.168.3.2 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 = 0ms, 最长 = 7ms, 平均 = 1ms
```

[1B、分别显示并截屏路由器 R1 和 R2 的 LS 数据库信息(database, router LSA, network LSA)]

show ip ospf database ！显示 OSPF 链路状态数据库信息。

R1

```
20-RSR20-1(config)#show ip ospf database

            OSPF Router with ID (6.6.6.6) (Process ID 1)

                Router Link States (Area 0.0.0.0)

Link ID         ADV Router      Age  Seq#       CkSum  Link count
6.6.6.6         6.6.6.6         140  0x80000012 0xe558 3
6.6.6.7         6.6.6.7         146  0x8000000f 0x3783 2

                Network Link States (Area 0.0.0.0)

Link ID         ADV Router      Age  Seq#       CkSum
192.168.2.2     6.6.6.7         146  0x80000002 0xecb4
```

R2

```
20-RSR20-2(config-if-GigabitEthernet 0/0)#show ip ospf database

            OSPF Router with ID (6.6.6.7) (Process ID 1)

                Router Link States (Area 0.0.0.0)

Link ID         ADV Router      Age  Seq#       CkSum  Link count
6.6.6.6         6.6.6.6         200  0x80000012 0xe558 3
6.6.6.7         6.6.6.7         204  0x8000000f 0x3783 2

                Network Link States (Area 0.0.0.0)

Link ID         ADV Router      Age  Seq#       CkSum
192.168.2.2     6.6.6.7         204  0x80000002 0xecb4
```

show ip ospf database router ！显示 router LSA

R1	R2

```
20-RSR20-1(config)#show ip ospf database router

            OSPF Router with ID (6.6.6.6) (Process ID 1)

                Router Link States (Area 0.0.0.0)

  LS age: 232
  Options: 0x2 (-|-|-|-|-|-|E|-)
  Flags: 0x0
  LS Type: router-LSA
  Link State ID: 6.6.6.6
  Advertising Router: 6.6.6.6
  LS Seq Number: 80000012
  Checksum: 0xe558
  Length: 60
   Number of Links: 3

    Link connected to: Stub Network
     (Link ID) Network/subnet number: 192.168.1.0
     (Link Data) Network Mask: 255.255.255.0
      Number of TOS metrics: 0
       TOS 0 Metric: 1

    Link connected to: Stub Network
     (Link ID) Network/subnet number: 192.168.4.1
     (Link Data) Network Mask: 255.255.255.255
      Number of TOS metrics: 0
       TOS 0 Metric: 0

    Link connected to: a Transit Network
     (Link ID) Designated Router address: 192.168.2.2
     (Link Data) Router Interface address: 192.168.2.1
      Number of TOS metrics: 0
       TOS 0 Metric: 1

  LS age: 238
  Options: 0x2 (-|-|-|-|-|-|E|-)
  Flags: 0x0
  LS Type: router-LSA
  Link State ID: 6.6.6.7
  Advertising Router: 6.6.6.7
  LS Seq Number: 8000000f
  Checksum: 0x3783
  Length: 48
   Number of Links: 2

    Link connected to: a Transit Network
     (Link ID) Designated Router address: 192.168.2.2
     (Link Data) Router Interface address: 192.168.2.2
      Number of TOS metrics: 0
       TOS 0 Metric: 1

    Link connected to: Stub Network
     (Link ID) Network/subnet number: 192.168.3.0
     (Link Data) Network Mask: 255.255.255.0
      Number of TOS metrics: 0
       TOS 0 Metric: 1
```

```
20-RSR20-2(config-if-GigabitEthernet 0/0)#show ip ospf database router

            OSPF Router with ID (6.6.6.7) (Process ID 1)

                Router Link States (Area 0.0.0.0)

  LS age: 263
  Options: 0x2 (-|-|-|-|-|-|E|-)
  Flags: 0x0
  LS Type: router-LSA
  Link State ID: 6.6.6.6
  Advertising Router: 6.6.6.6
  LS Seq Number: 80000012
  Checksum: 0xe558
  Length: 60
   Number of Links: 3

    Link connected to: Stub Network
     (Link ID) Network/subnet number: 192.168.1.0
     (Link Data) Network Mask: 255.255.255.0
      Number of TOS metrics: 0
       TOS 0 Metric: 1

    Link connected to: Stub Network
     (Link ID) Network/subnet number: 192.168.4.1
     (Link Data) Network Mask: 255.255.255.255
      Number of TOS metrics: 0
       TOS 0 Metric: 0

    Link connected to: a Transit Network
     (Link ID) Designated Router address: 192.168.2.2
     (Link Data) Router Interface address: 192.168.2.1
      Number of TOS metrics: 0
       TOS 0 Metric: 1

  LS age: 267
  Options: 0x2 (-|-|-|-|-|-|E|-)
  Flags: 0x0
  LS Type: router-LSA
  Link State ID: 6.6.6.7
  Advertising Router: 6.6.6.7
  LS Seq Number: 8000000f
  Checksum: 0x3783
  Length: 48
   Number of Links: 2

    Link connected to: a Transit Network
     (Link ID) Designated Router address: 192.168.2.2
     (Link Data) Router Interface address: 192.168.2.2
      Number of TOS metrics: 0
       TOS 0 Metric: 1

    Link connected to: Stub Network
     (Link ID) Network/subnet number: 192.168.3.0
     (Link Data) Network Mask: 255.255.255.0
      Number of TOS metrics: 0
```

 # show ip ospf database network　　! 显示 network LSA

R1

```
20-RSR20-1(config)#show ip ospf database network

            OSPF Router with ID (6.6.6.6) (Process ID 1)

                Network Link States (Area 0.0.0.0)

  LS age: 296
  Options: 0x2 (-|-|-|-|-|-|E|-)
  LS Type: network-LSA
  Link State ID: 192.168.2.2 (address of Designated Router)
  Advertising Router: 6.6.6.7
  LS Seq Number: 80000002
  Checksum: 0xecb4
  Length: 32
  Network Mask: /24
        Attached Router: 6.6.6.7
        Attached Router: 6.6.6.6
```

R2

```
20-RSR20-2(config-if-GigabitEthernet 0/0)#show ip ospf database network

            OSPF Router with ID (6.6.6.7) (Process ID 1)

                Network Link States (Area 0.0.0.0)

  LS age: 320
  Options: 0x2 (-|-|-|-|-|-|E|-)
  LS Type: network-LSA
  Link State ID: 192.168.2.2 (address of Designated Router)
  Advertising Router: 6.6.6.7
  LS Seq Number: 80000002
  Checksum: 0xecb4
  Length: 32
  Network Mask: /24
        Attached Router: 6.6.6.7
        Attached Router: 6.6.6.6
```

[1C、显示并截屏 R1 的邻居状态]

show ip ospf neighbor

```
20-RSR20-1(config)#show ip ospf neighbor

OSPF process 1, 1 Neighbors, 1 is Full:
Neighbor ID     Pri   State           BFD State  Dead Time   Address         Interface
6.6.6.7           1   Full/DR         -          00:00:37    192.168.2.2     GigabitEthernet 0/0
```

[1D、 显示并截屏 R1 的所有接口信息]

show ip ospf interface

```
20-RSR20-1(config)#show ip ospf interface
GigabitEthernet 0/0 is up, line protocol is up
  Internet Address 192.168.2.1/24, Ifindex 4, Area 0.0.0.0, MTU 1500
  Matching network config: 192.168.2.0/24
  Process ID 1, Router ID 6.6.6.6, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 6.6.6.7, Interface Address 192.168.2.2
  Backup Designated Router (ID) 6.6.6.6, Interface Address 192.168.2.1
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:05
  Neighbor Count is 1, Adjacent neighbor count is 1
  Crypt Sequence Number is 0
  Hello received 254 sent 263, DD received 10 sent 12
  LS-Req received 3 sent 3, LS-Upd received 15 sent 12
  LS-Ack received 8 sent 11, Discarded 0
GigabitEthernet 0/1 is up, line protocol is up
  Internet Address 192.168.1.1/24, Ifindex 5, Area 0.0.0.0, MTU 1500
  Matching network config: 192.168.1.0/24
  Process ID 1, Router ID 6.6.6.6, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 6.6.6.6, Interface Address 192.168.1.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07
  Neighbor Count is 0, Adjacent neighbor count is 0
  Crypt Sequence Number is 0
  Hello received 0 sent 270, DD received 0 sent 0
  LS-Req received 0 sent 0, LS-Upd received 0 sent 0
  LS-Ack received 0 sent 0, Discarded 0
Loopback 0 is up, line protocol is up
  Internet Address 192.168.4.1/32, Ifindex 16385, Area 0.0.0.0, MTU 1500
  Matching network config: 192.168.4.1/32
  Process ID 1, Router ID 6.6.6.6, Network Type LOOPBACK, Cost: 0
  Transmit Delay is 1 sec, State Loopback
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
```

[1E、显示并截屏 R1 和 R2 的路由表]

show ip route

R1 的路由表：

```
20-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, GigabitEthernet 0/0
C    192.168.2.1/32 is local host.
O    192.168.3.0/24 [110/2] via 192.168.2.2, 00:07:17, GigabitEthernet 0/0
C    192.168.4.1/32 is local host.
```

R2 的路由表：

```
20-RSR20-2(config-if-GigabitEthernet 0/0)#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
O    192.168.1.0/24 [110/2] via 192.168.2.1, 00:07:21, GigabitEthernet 0/0
C    192.168.2.0/24 is directly connected, GigabitEthernet 0/0
C    192.168.2.2/32 is local host.
C    192.168.3.0/24 is directly connected, GigabitEthernet 0/1
```

[1F、把 R1 和 R2 的当前配置信息保存在 s1.txt 中]

 # show run

见 s1.txt，R1 的配置和 R2 的配置之间已用短横线分隔。

[1G]、问题 1:R1 和 R2 的路由器 ID 是 6.6.6.6 和 6.6.6.7 ,是否符合 RID 的获得方法？(是/否) 是 。

问题 2：R1 和 R2 之间的网络的 DR（指定路由器）是 R2 ，BDR（指定路由器）是 R1 。

问题 3： 网络 192.168.1.0/24、192.168.2.0/24、192.168.3.0/24、192.168.4.1/32 的链路开销(metric)分别是 1 ， 1 ， 1 ， 0 。*指各直连路由器到这些网络的链路开销。

[1I、拔去 R2 连到 PC2 的接口连线，截屏 R1 的路由表]

 # show ip route

```
20-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, GigabitEthernet 0/0
C    192.168.2.1/32 is local host.
C    192.168.4.1/32 is local host.
```

2、接步骤 1，通过加大另一台路由器的优先权使之成为 DR。

命令： **(config-if)#ip ospf priority 8** ！合法的范围是 0~255。 缺省的优先级为 1。优先级为 0 不参与选举 DR

[2A、问题：在配置完毕后，R1 和 R2 之间的网络的 DR 是 R1 ，BDR 是 R2 。]

[2B、在调试状态下，先断开或者 shutdown R1 和 R2 的连接，然后接通，看是否可以捕捉到指定路由器的选举过程。

命令： **#debug ip ospf ！进入调试状态**

#no debug all ！取消调试状态]

描述有关的发包情况。

[2C、问题：接通后，R1 和 R2 之间的网络的 DR 是 R1 ，BDR 是 R2 。]

[2D、在调试状态下，查看并截屏 R1 和 R2 之间接口接通后数据库同步的发包情况。

命令： **#debug ip ospf ！进入调试状态**

#no debug all ！取消调试状态]

```
*Jun 15 14:10:41: %7:   DRouter 192.168.1.1
*Jun 15 14:10:41: %7:   BDRouter 0.0.0.0
*Jun 15 14:10:41: %7:   # Neighbors 0
*Jun 15 14:10:41: %7: ------------------------------------------------------
*Jun 15 14:10:41: %7: LSA[MaxAge]: Maxage walker finished (0.000000 sec)
*Jun 15 14:10:48: %LINK-3-UPDOWN: Interface GigabitEthernet 0/0, changed state to up.
*Jun 15 14:10:48: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet 0/0, changed state to up.
*Jun 15 14:10:48: %7: NSM Message Header
*Jun 15 14:10:48: %7:  VR ID: 0
*Jun 15 14:10:48: %7:  VRF ID: 0
*Jun 15 14:10:48: %7:  Message type: Link Up (29)
*Jun 15 14:10:48: %7:  Message length: 112
*Jun 15 14:10:48: %7:  Message ID: 0x00000000
*Jun 15 14:10:48: %7: NSM Interface
*Jun 15 14:10:48: %7:  Interface index: 4
*Jun 15 14:10:48: %7:  Name: GigabitEthernet 0/0
*Jun 15 14:10:48: %7:  Flags: 0x00901043
*Jun 15 14:10:48: %7:  HW type: 2
*Jun 15 14:10:48: %7:  HW len: 6
*Jun 15 14:10:48: %7:  HW address: 5869.6c27.c09d
*Jun 15 14:10:48: %7: Get interface[GigabitEthernet 0/0](ipv4) up msg from NSM, bandwidth = 1000000Kbits/s, mtu = 1500, flag = 0x90
1043
*Jun 15 14:10:48: %7: OS[GigabitEthernet 0/0:192.168.2.1]: Join to AllSPFRouters Multicast group
*Jun 15 14:10:48: %7: NSM[Route]: add OSPF route [192.168.2.0/24-0.0.0.0] to vrf default
*Jun 15 14:10:48: %7: [ospfd] --> [NSM] -----------start
*Jun 15 14:10:48: %7: NSM IPv4 route add
*Jun 15 14:10:48: %7:  Flags: 1
*Jun 15 14:10:48: %7:  Route: 192.168.2.0/24
*Jun 15 14:10:48: %7:  Type: 6
*Jun 15 14:10:48: %7:  SAFI: 0
*Jun 15 14:10:48: %7:  process_id: 1
*Jun 15 14:10:48: %7:  Metric: 1
*Jun 15 14:10:48: %7:  Distance: 110
*Jun 15 14:10:48: %7:  Sub_type: 0
*Jun 15 14:10:48: %7:  Nexthop: 0.0.0.0 ifindex 4 flag: 0 as: 0
*Jun 15 14:10:48: %7: [ospfd] --> [NSM] -----------end
*Jun 15 14:10:48: %7: IFSM[GigabitEthernet 0/0:192.168.2.1]: Down (InterfaceUp)
*Jun 15 14:10:48: %7: IFSM[GigabitEthernet 0/0:192.168.2.1]: Status change Down -> Waiting
*Jun 15 14:10:48: %7: OSPF[1]: LSA refresh timer expire
*Jun 15 14:10:48: %7: SPF[0.0.0.0]: Calculation timer scheduled (delay 1.000000 secs)
*Jun 15 14:10:48: %7: LSA[0.0.0.0:Type1:6.6.6.6:(self)]: Install router-LSA
*Jun 15 14:10:48: %7: LSA[0.0.0.0:Type1:6.6.6.6:(self)]: LSA refresh scheduled at LS age 1780
*Jun 15 14:10:48: %7: LSA[0.0.0.0:Type1:6.6.6.6:(self)]: Flooding via interface[GigabitEthernet 0/1:192.168.1.1]
*Jun 15 14:10:48: %7: LSA[0.0.0.0:Type1:6.6.6.6:(self)]: Flooding via interface[Loopback 0:192.168.4.1]
*Jun 15 14:10:48: %7: LSA[0.0.0.0:Type1:6.6.6.6:(self)]: Flooding via interface[GigabitEthernet 0/0:192.168.2.1]
*Jun 15 14:10:48: %7: LSA[0.0.0.0:Type1:6.6.6.6:(self)]: router-LSA refreshed
*Jun 15 14:10:48: %7:   LSA Header
*Jun 15 14:10:48: %7:     LS age 0
*Jun 15 14:10:48: %7:     Options 0x2
*Jun 15 14:10:48: %7:     LS type 1 (router-LSA)
*Jun 15 14:10:48: %7:     Link State ID 6.6.6.6
*Jun 15 14:10:48: %7:     Advertising Router 6.6.6.6
*Jun 15 14:10:48: %7:     LS sequence number 0x80000023
*Jun 15 14:10:48: %7:     LS checksum 0x2476
*Jun 15 14:10:48: %7:     length 60
*Jun 15 14:10:48: %7: ospf[1]: LSA refresh completed [0.000000 sec], count: 1
*Jun 15 14:10:48: %7: IFSM[GigabitEthernet 0/0:192.168.2.1]: Hello timer expire
*Jun 15 14:10:48: %7: SEND[Hello]: To 224.0.0.5 via GigabitEthernet 0/0:192.168.2.1, length 44
*Jun 15 14:10:48: %7: ------------------------------------------------------
*Jun 15 14:10:48: %7: Header
```

```
*Jun 15 03:55:14: %7:   BDRouter 0.0.0.0
*Jun 15 03:55:14: %7:   # Neighbors 0
*Jun 15 03:55:14: %7: ------------------------------------------------------
*Jun 15 03:55:16: %7: LSA[MaxAge]: Maxage walker finished (0.000000 sec)
*Jun 15 03:55:21: %LINK-3-UPDOWN: Interface GigabitEthernet 0/0, changed state to up.
*Jun 15 03:55:21: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet 0/0, changed state to up.
*Jun 15 03:55:21: %7: NSM Message Header
*Jun 15 03:55:21: %7:  VR ID: 0
*Jun 15 03:55:21: %7:  VRF ID: 0
*Jun 15 03:55:21: %7:  Message type: Link Up (29)
*Jun 15 03:55:21: %7:  Message length: 112
*Jun 15 03:55:21: %7:  Message ID: 0x00000000
*Jun 15 03:55:21: %7: NSM Interface
*Jun 15 03:55:21: %7:  Interface index: 4
*Jun 15 03:55:21: %7:  Name: GigabitEthernet 0/0
*Jun 15 03:55:21: %7:  Flags: 0x00901043
*Jun 15 03:55:21: %7:  HW type: 2
*Jun 15 03:55:21: %7:  HW len: 6
*Jun 15 03:55:21: %7:  HW address: 5869.6c27.b5a9
*Jun 15 03:55:21: %7: Get interface[GigabitEthernet 0/0](ipv4) up msg from NSM, bandwidth = 1000000Kbits/s, mtu = 1500, flag = 0x90
1043
*Jun 15 03:55:21: %7: OS[GigabitEthernet 0/0:192.168.2.2]: Join to AllSPFRouters Multicast group
*Jun 15 03:55:21: %7: NSM[Route]: add OSPF route [192.168.2.0/24-0.0.0.0] to vrf default
*Jun 15 03:55:21: %7: [ospfd] --> [NSM] ----------start
*Jun 15 03:55:21: %7: NSM IPv4 route add
*Jun 15 03:55:21: %7:  Flags: 1
*Jun 15 03:55:21: %7:  Route: 192.168.2.0/24
*Jun 15 03:55:21: %7:  Type: 6
*Jun 15 03:55:21: %7:  SAFI: 0
*Jun 15 03:55:21: %7:  process_id: 1
*Jun 15 03:55:21: %7:  Metric: 1
*Jun 15 03:55:21: %7:  Distance: 110
*Jun 15 03:55:21: %7:  Sub_type: 0
*Jun 15 03:55:21: %7:  Nexthop: 0.0.0.0 ifindex 4 flag: 0 as: 0
*Jun 15 03:55:21: %7: [ospfd] --> [NSM] ----------end
*Jun 15 03:55:21: %7: IFSM[GigabitEthernet 0/0:192.168.2.2]: Down (InterfaceUp)
*Jun 15 03:55:21: %7: IFSM[GigabitEthernet 0/0:192.168.2.2]: Status change Down -> Waiting
*Jun 15 03:55:21: %7: OSPF[1]: LSA refresh timer expire
*Jun 15 03:55:21: %7: SPF[0.0.0.0]: Calculation timer scheduled (delay 1.000000 secs)
*Jun 15 03:55:21: %7: LSA[0.0.0.0:Type1:6.6.6.7:(self)]: Install router-LSA
*Jun 15 03:55:21: %7: LSA[0.0.0.0:Type1:6.6.6.7:(self)]: LSA refresh scheduled at LS age 1759
*Jun 15 03:55:21: %7: LSA[0.0.0.0:Type1:6.6.6.7:(self)]: Flooding via interface[GigabitEthernet 0/0:192.168.2.2]
*Jun 15 03:55:21: %7: LSA[0.0.0.0:Type1:6.6.6.7:(self)]: Flooding via interface[GigabitEthernet 0/1:192.168.3.1]
*Jun 15 03:55:21: %7: LSA[0.0.0.0:Type1:6.6.6.7:(self)]: router-LSA refreshed
*Jun 15 03:55:21: %7:   LSA Header
*Jun 15 03:55:21: %7:     LS age 0
*Jun 15 03:55:21: %7:     Options 0x2
*Jun 15 03:55:21: %7:     LS type 1 (router-LSA)
*Jun 15 03:55:21: %7:     Link State ID 6.6.6.7
*Jun 15 03:55:21: %7:     Advertising Router 6.6.6.7
*Jun 15 03:55:21: %7:     LS sequence number 0x8000001d
*Jun 15 03:55:21: %7:     LS checksum 0xaf6b
*Jun 15 03:55:21: %7:     length 48
*Jun 15 03:55:21: %7: ospf[1]: LSA refresh completed [0.000000 sec], count: 1
*Jun 15 03:55:21: %7: IFSM[GigabitEthernet 0/0:192.168.2.2]: Hello timer expire
*Jun 15 03:55:21: %7: SEND[Hello]: To 224.0.0.5 via GigabitEthernet 0/0:192.168.2.2, length 44
*Jun 15 03:55:21: %7: ------------------------------------------------------
*Jun 15 03:55:21: %7: Header
*Jun 15 03:55:21: %7:   Version 2
*Jun 15 03:55:21: %7:   Type 1 (Hello)
```

[2E、截屏**#show ip ospf neighbor** 的结果]

R1：

```
20-RSR20-2#show ip ospf neighbor

OSPF process 1, 1 Neighbors, 1 is Full:
Neighbor ID     Pri   State           BFD State  Dead Time   Address         Interface
6.6.6.6           8   Full/DR         -          00:00:36    192.168.2.1     GigabitEthernet 0/0
```

R2：

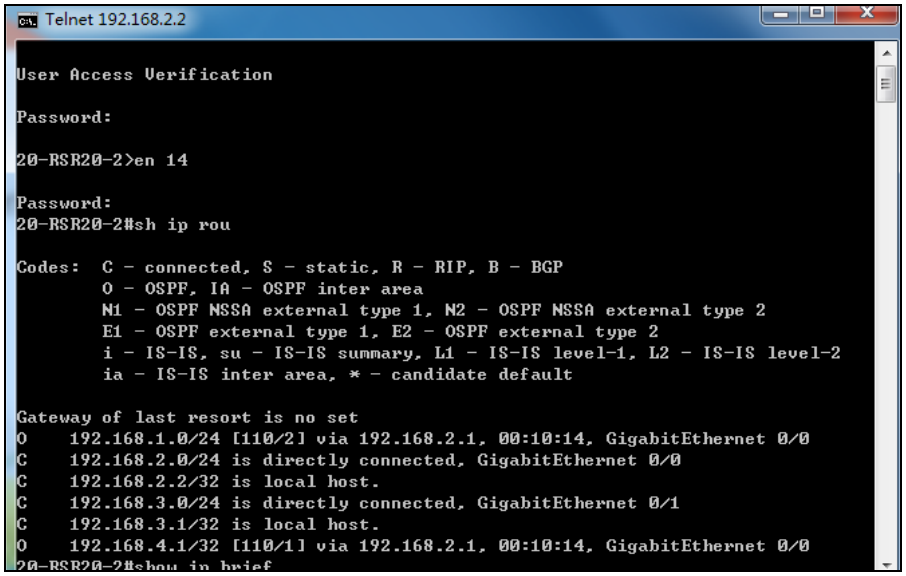
```
20-RSR20-1#show ip ospf neighbor

OSPF process 1, 1 Neighbors, 1 is Full:
Neighbor ID     Pri   State           BFD State  Dead Time   Address         Interface
6.6.6.7           1   Full/BDR        -          00:00:30    192.168.2.2     GigabitEthernet 0/0
```

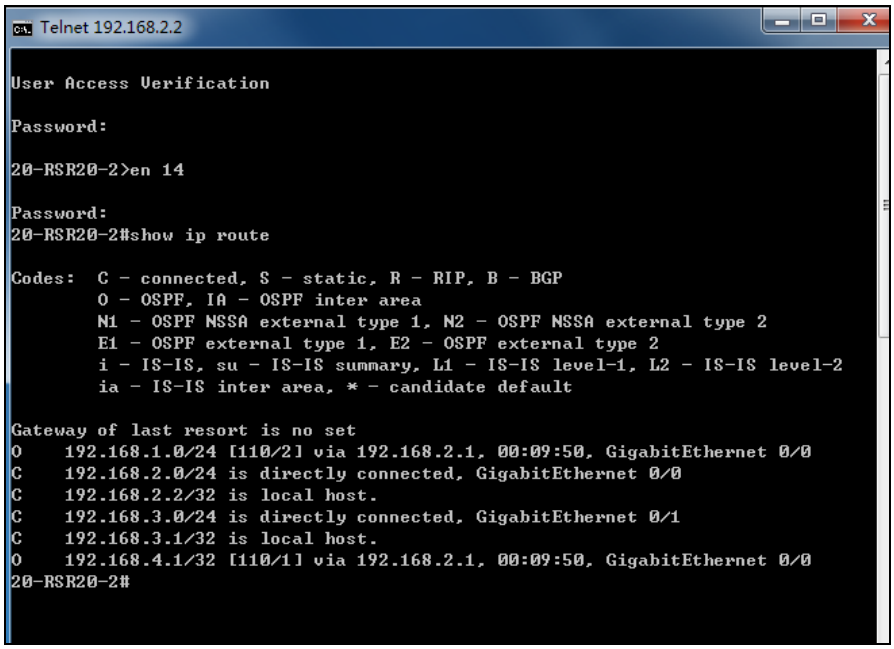
3、接步骤 2，PC1 和 PC2 同时在控制台窗口用命令 telnet 192.168.2.2 进入 R2，并在执行以下命令后截屏：

(config)#sh ip rou

[3A、PC1 截屏]



[3B、PC2 截屏]



[3C、这个步骤说明了什么？]

PC1 和 PC2 可以同时通过 telnet 进入 R2。

一般我们通过 Web 页面来连接路由器等设备时，实际上是利用 RCMS 服务器通过 console 接口反向 telnet 到路由器等设备上进行配置的，RCMS 服务器有自己的 IP 地址（172.16.X.5），当 RCMS 与路由器建立 telnet 连接时，一个 TCP 连接随之建立，该 TCP 连接由唯一的四元组确定，此时不能再建立另一条与同一台路由器相连的 telnet 连接，因为会导致四元组冲突。所以效果就是同一时刻只能有一台设备建立 telnet 连接。

而在本步骤中我们发现 PC1 和 PC2 可以同时 telnet 进入同一台路由器，这是因为这时的 telnet 连接并非通过 RCMS 建立的，而是由 PC 直接与路由器建立的，所以 PC1 和 PC2 与 R2 之间 TCP 连接的源 IP 地址是不同的，也就是这两个连接有着不同的四元组，因此可以同时 telnet 而不会冲突。