# lab3 report

PB22111639 马筱雅

# 实验内容

- 必做
- 选做1-负载均衡
- 选做2-6in4

# 1 必做内容

## 子网划分

**学号后三位:** 639 , **将高新区路由与西区路由直接相连**,划分方案如下

校区	子网
中区-东区路由	63.9.1.0/24
中区-西区路由	63.9.4.0/24
南区	63.9.3.0/24
北区	63.9.0.0/24
东区	63.9.2.0/24
西区	63.9.5.0/24
西区-高新区路由	63.9.6.0/24
高新区	63.9.7.0/24

# 路由器接口连接及IP地址分配

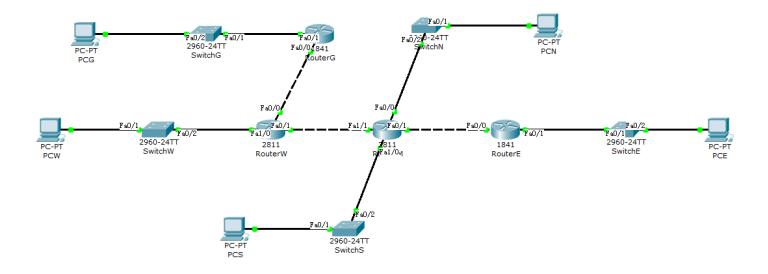
Device	Interface	IP Address	Mask	To Device	To Interface
RouterM Cisco 2811	Fa0/0	63.9.0.1	255.255.255.0	SwitchN	Fa0/2
	Fa0/1	63.9.1.1		RouterE	Fa0/0

(NM-2FE2W module*1)	Fa1/0	63.9.3.1		SwitchS	Fa0/2
	Fa1/1	63.9.4.1		RouterW	Fa0/1
RouterW Cisco 2811 (NM-2FE2W module*1)	Fa0/0	63.9.6.1	255.255.255.0	RouterG	Fa0/0
	Fa0/1	63.9.4.2		RouterM	Fa1/1
	Fa1/0	63.9.5.1		SwitchW	Fa0/2
RouterE Cisco 1841	Fa0/0	63.9.1.2	255.255.255.0	RouterM	Fa0/1
	Fa0/1	63.9.2.1		SwitchE	Fa0/1
RouterG Cisco 1841	Fa0/0	63.9.6.2	255.255.255.0	RouterW	Fa0/0
	Fa0/1	63.9.7.1		SwitchG	Fa0/1

# 终端设备接口连接及IP地址

Device	IP Address	Mask	Gateway
PCN	63.9.0.2	255.255.255.0	63.9.0.1
PCS	63.9.3.2	255.255.255.0	63.9.3.1
PCW	63.9.5.2	255.255.255.0	63.9.5.1
PCE	63.9.2.2	255.255.255.0	63.9.2.1
PCG	63.9.7.2	255.255.255.0	63.9.7.1

### 配置结果

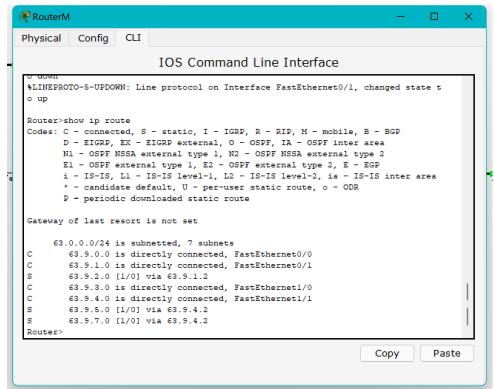


### 静态路由配置

#### RouterM, 中校区路由

对于目的地东校区、西校区和高新校区,RouterM不能直接到达,故需要配置。

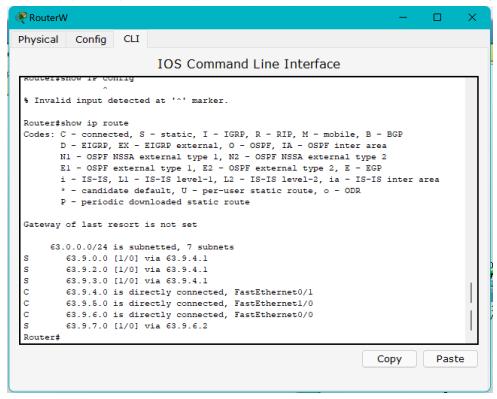
- 目标主机为 PCW 和 PCG , 则下一跳地址为 RouterW Fa0/1 的 IP 地址 , 即 63.9.4.2 。
- 目标主机为 PCE ,则下一跳地址为 RouterE Fa0/0 的 IP 地址,即 63.9.1.2。



#### RouterW, 西校区路由

对于目的地东、南、北校区和高新校区, RouterW不能直接到达, 故需要配置。

- 目标主机为 PCG , 则下一跳地址为 RouterG Fa0/1 的 IP 地址 , 即 63.9.6.2。
- 目标主机为 PCE, PCN, PCS,则下一跳地址为 RouterM Fa1/1 的 IP 地址,即 63.9.4.1。



#### RouterE, 东校区路由

对于目的地西、南、北校区和高新校区,RouterE不能直接到达,故需要配置。

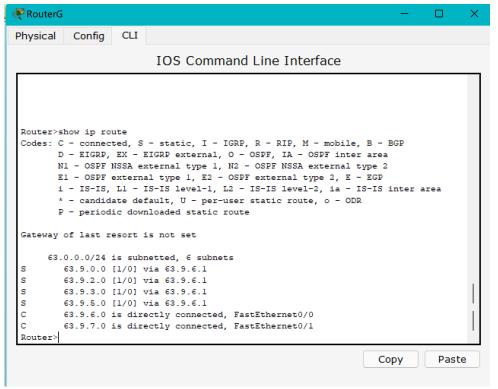
• 目标主机为 PCG, PCN, PCS, PCW, 下一跳地址为 RouterM Fa0/1 的 IP 地址, 即 63.9.1.1。

```
RouterE
Physical
        Config CLI
                          IOS Command Line Interface
 SYS-5-CONFIG I: Configured from console by console
Router#
 Router#
 Router#
Router#show ip route
 Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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
 Gateway of last resort is not set
      63.0.0.0/24 is subnetted, 6 subnets
        63.9.0.0 [1/0] via 63.9.1.1
С
        63.9.1.0 is directly connected, FastEthernet0/0
        63.9.2.0 is directly connected, FastEthernet0/1
s
        63.9.3.0 [1/0] via 63.9.1.1
        63.9.5.0 [1/0] via 63.9.1.1
        63.9.7.0 [1/0] via 63.9.1.1
                                                                              Paste
                                                                    Copy
```

#### RouterG

对于目的地西、南、北校区和东校区,RouterG不能直接到达,故需要配置。

• 目标主机为 PCE, PCN, PCS, PCW, 下一跳地址为 RouterW Fa0/0 的 IP 地址, 即 63.9.6.1。



### 具体配置结果如下

Router	NetWork	Mask	Next Hoop

RouterM	63.9.2.0 E	255.255.255.0	63.9.1.2
	63.9.5.0 W		63.9.4.2
	63.9.7.0 G		63.9.4.2
RouterE	63.9.0.0 N	255.255.255.0	63.9.1.1
	63.9.3.0 S		63.9.1.1
	63.9.5.0 W		63.9.1.1
	63.9.7.0 G		63.9.1.1
RouterG	63.9.0.0 N	255.255.255.0	63.9.6.1
	63.9.2.0 E		63.9.6.1
	63.9.3.0 S		63.9.6.1
	63.9.5.0 W		63.9.6.1
RouterW	63.9.0.0 N	255.255.255.0	63.9.4.1
	63.9.2.0 E		63.9.4.1
	63.9.3.0 S		63.9.4.1
	63.9.7.0 G		63.9.6.2

# 静态路由高新区连通性测试

通过一下图片可知, 当连接 63.9.3.2 和 63.9.2.2, 即南区主机和东区主机时,均能成功到达。

```
₹ PCG
Physical
                   Desktop
         Config
                                                                                   Χ
Command Prompt
 PC>tracert 63.9.3.2
 Tracing route to 63.9.3.2 over a maximum of 30 hops:
                           63 ms
                                     63.9.7.1
       63 ms
                 64 ms
      94 ms
                 94 ms
                           81 ms
                                     63.9.6.1
       126 ms
                 125 ms
                           126 ms
                                     63.9.4.1
       188 ms
                 188 ms
                           189 ms
                                     63.9.3.2
 Trace complete.
 PC>tracert 63.9.2.2
 Tracing route to 63.9.2.2 over a maximum of 30 hops:
       63 ms
                 62 ms
                           62 ms
                                     63.9.7.1
       94 ms
                 94 ms
                           94 ms
                                     63.9.6.1
       127 ms
                 126 ms
                           124 ms
                                     63.9.4.1
       157 ms
                 157 ms
                           157 ms
                                     63.9.1.2
       220 ms
                 219 ms
                           220 ms
                                     63.9.2.2
 Trace complete.
```

### 动态配置RIP

每个图片包含 show ip route 和 show ip protocols 两条命令

#### RouterM

- show ip route 指令可以看出该路由和所有子网相连,其中表明哪些子网是直接相连,哪些子网通过其他端口和IP地址相连,例如,要到达 63.9.2.0 要通过 63.9.1.2。
- show ip protocols 指令可以看出动态路由协议为 RIP , 包含四个接口 , 并且正在为 63.0.0.0 网络提供接口 , 从 63.9.1.2 和 63.9.4.2 两个网关学习到路由。
- 其他路由器信息与此类似。

Physical

Config CLI

```
Router(config) #exit
%SYS-5-CONFIG I: Configured from console by console
Router#show ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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
Gateway of last resort is not set
     63.0.0.0/24 is subnetted, 8 subnets
        63.9.0.0 is directly connected, FastEthernet0/0
       63.9.1.0 is directly connected, FastEthernet0/1
Ċ
R
       63.9.2.0 [120/1] via 63.9.1.2, 00:00:25, FastEthernet0/1
C
       63.9.3.0 is directly connected, FastEthernet1/0
C
       63.9.4.0 is directly connected, FastEthernet1/1
       63.9.5.0 [120/1] via 63.9.4.2, 00:00:12, FastEthernet1/1
R
       63.9.6.0 [120/1] via 63.9.4.2, 00:00:12, FastEthernet1/1
       63.9.7.0 [120/2] via 63.9.4.2, 00:00:12, FastEthernet1/1
Router#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 26 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 1, receive 1
  Interface
                       Send Recv Triggered RIP Key-chain
 FastEthernet0/0
                       1
 FastEthernet0/1
                      1
                              1
 FastEthernet1/0
                       1
                             1
 FastEthernet1/1
                       1
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
       63.0.0.0
Passive Interface(s):
Routing Information Sources:
                 Distance
        Gateway
                                     Last Update
        63.9.1.2
                            120
                                     00:00:17
       63.9.4.2
                            120
                                    00:00:07
Distance: (default is 120)
Router#
```

#### **RouterW**

```
RouterW 👺
Physical
         Config
                    CLI
 Router(config) #exit
 Router#
  %SYS-5-CONFIG I: Configured from console by console
 Router#show ip route
 Codes: C - connected, S - static, I - IGRP, 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, E - EGP
        i - IS-IS, 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
 Gateway of last resort is not set
      63.0.0.0/24 is subnetted, 8 subnets
         63.9.0.0 [120/1] via 63.9.4.1, 00:00:19, FastEthernet0/1
 R
         63.9.1.0 [120/1] via 63.9.4.1, 00:00:19, FastEthernet0/1
 R
         63.9.2.0 [120/2] via 63.9.4.1, 00:00:19, FastEthernet0/1
 R
 R
         63.9.3.0 [120/1] via 63.9.4.1, 00:00:19, FastEthernet0/1
         63.9.4.0 is directly connected, FastEthernet0/1
 C
 C
        63.9.5.0 is directly connected, FastEthernet1/0
 Ċ
        63.9.6.0 is directly connected, FastEthernet0/0
 R
         63.9.7.0 [120/1] via 63.9.6.2, 00:00:14, FastEthernet0/0
 Router#show ip protocols
 Routing Protocol is "rip"
 Sending updates every 30 seconds, next due in 12 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
 Outgoing update filter list for all interfaces is not set
 Incoming update filter list for all interfaces is not set
 Redistributing: rip
 Default version control: send version 1, receive 1
   Interface
                       Send Recv Triggered RIP Key-chain
   FastEthernet0/0
                       1
                               1
   FastEthernet0/1
                        1
                               1
   FastEthernet1/0
                         1
 Automatic network summarization is in effect
 Maximum path: 4
 Routing for Networks:
         63.0.0.0
         64.0.0.0
 Passive Interface(s):
 Routing Information Sources:
         Gateway
                         Distance
                                      Last Update
                                      00:00:08
         63.9.4.1
                              120
                                       00:00:07
         63.9.6.2
                              120
 Distance: (default is 120)
 Router#
```

#### RouterE

RouterE

Router>

```
Physical
        Config
                   CLI
 Router>sh
 Router>show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       {\tt N1} - OSPF NSSA external type 1, {\tt N2} - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, 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
Gateway of last resort is not set
     63.0.0.0/24 is subnetted, 8 subnets
        63.9.0.0 [120/1] via 63.9.1.1, 00:00:17, FastEthernet0/0
C
        63.9.1.0 is directly connected, FastEthernet0/0
C
        63.9.2.0 is directly connected, FastEthernet0/1
R
        63.9.3.0 [120/1] via 63.9.1.1, 00:00:17, FastEthernet0/0
R
        63.9.4.0 [120/1] via 63.9.1.1, 00:00:17, FastEthernet0/0
        63.9.5.0 [120/2] via 63.9.1.1, 00:00:17, FastEthernet0/0
R
R
        63.9.6.0 [120/2] via 63.9.1.1, 00:00:17, FastEthernet0/0
        63.9.7.0 [120/3] via 63.9.1.1, 00:00:17, FastEthernet0/0
Router>show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 4 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 1, receive 1
               Send Recv Triggered RIP Key-chain
  Interface
                       1
  FastEthernet0/0
                              1
  FastEthernet0/1
                              1
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
        63.0.0.0
 Passive Interface(s):
Routing Information Sources:
        Gateway
                    Distance
                                      Last Update
        63.9.1.1
                            120
                                      00:00:24
Distance: (default is 120)
```

#### RouterG

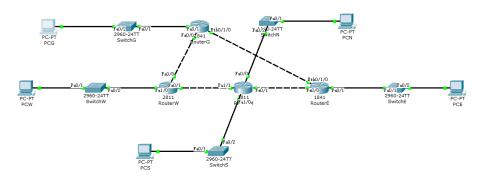
```
RouterG
         Config CLI
Physical
  % Invalid input detected at '^' marker.
 Router(config) #exit
 Router#
 %SYS-5-CONFIG I: Configured from console by console
 Router#show ip route
 Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, 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, E - EGP
        i - IS-IS, 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
 Gateway of last resort is not set
      63.0.0.0/24 is subnetted, 8 subnets
         63.9.0.0 [120/2] via 63.9.6.1, 00:00:23, FastEthernet0/0
 R
 R
         63.9.1.0 [120/2] via 63.9.6.1, 00:00:23, FastEthernet0/0
         63.9.2.0 [120/3] via 63.9.6.1, 00:00:23, FastEthernet0/0
 R
         63.9.3.0 [120/2] via 63.9.6.1, 00:00:23, FastEthernet0/0
 R
         63.9.4.0 [120/1] via 63.9.6.1, 00:00:23, FastEthernet0/0
         63.9.5.0 [120/1] via 63.9.6.1, 00:00:23, FastEthernet0/0
 R
 C
        63.9.6.0 is directly connected, FastEthernet0/0
 C
         63.9.7.0 is directly connected, FastEthernet0/1
 Router# show
 Router#show ip protocols
 Routing Protocol is "rip"
 Sending updates every 30 seconds, next due in 17 seconds
 Invalid after 180 seconds, hold down 180, flushed after 240
 Outgoing update filter list for all interfaces is not set
 Incoming update filter list for all interfaces is not set
 Redistributing: rip
 Default version control: send version 1, receive 1
                    Send Recv Triggered RIP Key-chain
   Interface
                       1
   FastEthernet0/0
                             1
   FastEthernet0/1
                        1
                              1
 Automatic network summarization is in effect
 Maximum path: 4
 Routing for Networks:
        63.0.0.0
 Passive Interface(s):
 Routing Information Sources:
                    Distance
         Gateway
                                      Last Update
         63.9.6.1
                            120
                                       00:00:18
 Distance: (default is 120)
 Router#
```

### 连通性测试

```
₹ PCG
                                                                               Desktop
Physical
          Config
                                                                                    Х
 Command Prompt
 PC>tracert 63.9.0.2
 Tracing route to 63.9.0.2 over a maximum of 30 hops:
                  47 ms
                                      63.9.7.1
       63 ms
                            64 ms
       94 ms
                  94 ms
                            94 ms
                                      63.9.6.1
       126 ms
                  110 ms
                            125 ms
                                      63.9.4.1
                            189 ms
                                      63.9.0.2
                  188 ms
       188 ms
 Trace complete.
 PC>tracert 63.9.2.2
 Tracing route to 63.9.2.2 over a maximum of 30 hops:
       63 ms
                  63 ms
                            63 ms
                                      63.9.7.1
       93 ms
                  94 ms
                            93 ms
                                      63.9.6.1
                                      63.9.4.1
       125 ms
                  127 ms
                            125 ms
       158 ms
                  157 ms
                            142 ms
                                      63.9.1.2
       219 ms
                  205 ms
                                      63.9.2.2
                            204 ms
 Trace complete.
 PC>
```

# 2 选做1-负载均衡

• 建立冗余链路,将高新区路由 RouterG 和东区 RouterE 路由相连。同时为新的端口分配新的 IP 地址,其中 RouterG Eth0/1/0 的 IP 为 63.9.8.1 ,与此相连的 RouterE 的端口 IP 为 63.9.8.2 。



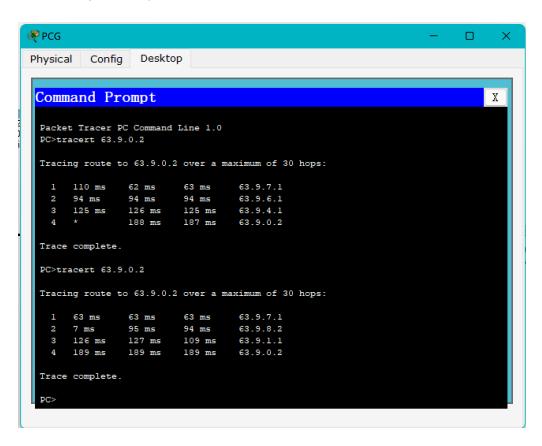
• 可以看出,从高新校区网络到南区网络和北区网络,可以通过 RouterW 和 RouterE 中转,从而实现负载均衡。从下图可看出,从 RouterM 到高新区网络,可以通过 63.9.4.2 和 63.9.1.2 ,从而存在两条路径。

```
Router M
                                                                             Physical Config CLI
                          IOS Command Line Interface
Router#show ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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
Gateway of last resort is not set
     63.0.0.0/24 is subnetted, 9 subnets
        63.9.0.0 is directly connected, FastEthernet0/0
        63.9.1.0 is directly connected, FastEthernet0/1
        63.9.2.0 [120/1] via 63.9.1.2, 00:00:24, FastEthernet0/1
        63.9.3.0 is directly connected, FastEthernet1/0
        63.9.4.0 is directly connected, FastEthernet1/1
R
        63.9.5.0 [120/1] via 63.9.4.2, 00:00:26, FastEthernet1/1
        63.9.6.0 [120/1] via 63.9.4.2, 00:00:26, FastEthernet1/1
        63.9.7.0 [120/2] via 63.9.4.2, 00:00:26, FastEthernet1/1
                 [120/2] via 63.9.1.2, 00:00:24, FastEthernet0/1
R
        63.9.8.0 [120/1] via 63.9.1.2, 00:00:24, FastEthernet0/1
Router#
                                                                   Copy
                                                                              Paste
```

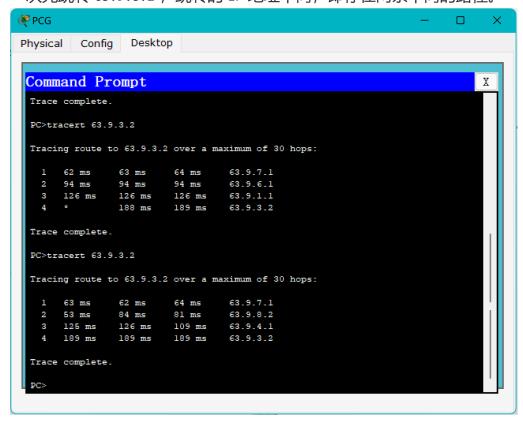
### 结果

#### 到北校区两条路径

可以看出,从高新区主机 63.9.7.2 到北区主机 63.9.0.2 ,连续两次 tracert ,跳转的 IP 地址不同,即存在两条不同的路径。



可以看出,从高新区主机 63.9.7.2 到北区主机 63.9.3.2,连续两次 tracert,一次先跳转 63.9.6.1, 一次先跳转 63.9.8.2,跳转的 IP 地址不同,即存在两条不同的路径。



# 3 选做2: 6in64

采用\*\*自动分配 ipv6 \*\*的地址

- 为 PCW 的子网分配 ipv6 地址, 为 639:1::/64
- 为 PCE 的子网分配 ipv6 地址, 为 639:2::/64

## 连通结果

下图展示了从不同主机连接对方主机的结果及其各自的IP地址

```
Command Prompt
                                                                          Х
Packet Tracer PC Command Line 1.0
PC>tracert 639:2::260:5CFF:FEEB:146
Tracing route to 639:2::260:5CFF:FEEB:146 over a maximum of 30 hops:
      1 ms
               0 ms
                        0 ms
                                  639:1::204:9AFF:FE21:2001
     0 ms
                        0 ms
                                  1639::2
               1 ms
     1 ms
               0 ms
                        1 ms
                                  639:2::260:5CFF:FEEB:146
Trace complete.
PC>ipv6config
FastEthernet0 Connection:(default port)
   Link-local IPv6 Address...... FE80::260:47FF:FE1C:4109
   IPv6 Address..... 639:1::260:47FF:FE1C:4109/64
   Default Gateway..... FE80::204:9AFF:FE21:2001
   DHCPv6 Client DUID...... 00-01-00-01-28-69-C9-54-00-60-47-1C-41-09
PC>
```

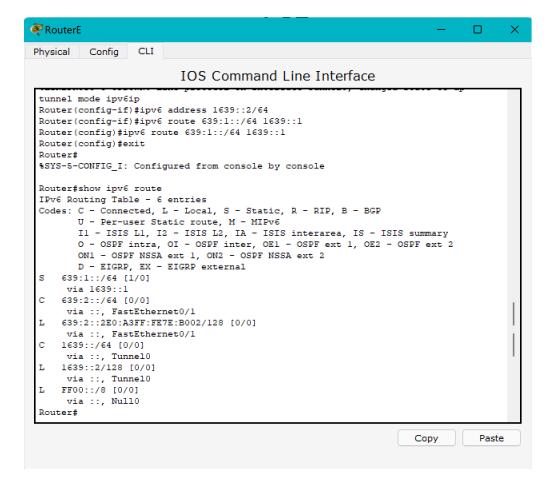
#### **PCE**

```
Packet Tracer PC Command Line 1.0
PC>ipv6ip
Invalid Command.
PC>ipv6config
FastEthernet0 Connection: (default port)
  Link-local IPv6 Address..... FE80::260:5CFF:FEEB:146
  IPv6 Address..... 639:2::260:5CFF:FEEB:146/64
  Default Gateway..... : FE80::2E0:A3FF:FE7E:B002
  DHCPv6 Client DUID...... 00-01-00-01-B4-80-8C-24-00-60-5C-EB-01-46
PC>tracert 639:1::260:47FF:FE1C:4109
Tracing route to 639:1::260:47FF:FE1C:4109 over a maximum of 30 hops:
              0 ms
                        1 ms
                                 639:2::2E0:A3FF:FE7E:B002
     0 ms
              0 ms
                        1 ms
                                 1639::1
     0 ms
     0 ms
              0 ms
                       0 ms
                                 639:1::260:47FF:FE1C:4109
Trace complete.
PC>
```

# show ipv6 config

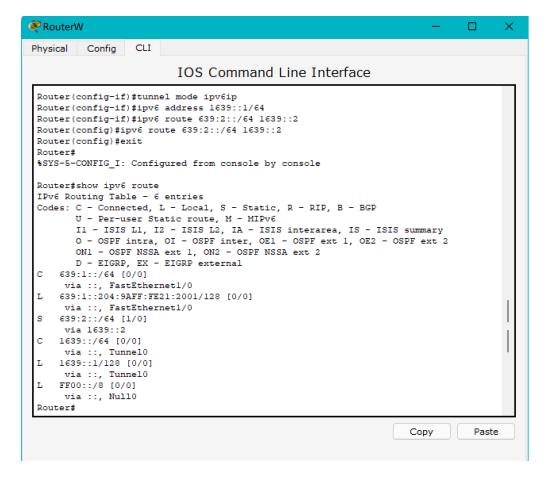
#### RouterE

可以看出,包含 Tunnel 部分的信息为, C 连接路由,网络 1639::/64 通过 Tunnel0 接口连接,目标地址为 1639::2/128



#### **RouterW**

可以看出,包含 Tunnel 部分的信息为, c 连接路由,网络 1639::/64 通过 Tunnel0 接口连接,目标地址为 1639::1/128 ,表示目标为西校区。



#### **RouterM**

RouterM 未配置 ipv6。

```
Router>show ipv6 route

IPv6 Routing Table - 0 entries

Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP

U - Per-user Static route, M - MIPv6

Il - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary

O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2

ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2

D - EIGRP, EX - EIGRP external

Router>
```