《计算机网络》实验报告

(2022~2023 学年第一学期)

实验名称：静态路由与动态路由

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实验名称 (实验 3:静态路由与动态路由)

1 实验目的

掌握静态路由协议，理解路由器工作原理，掌握路由器相关的配置、检测操作。

理解动态路由协议RP的工作原理；掌握采用动态路由协议RP进行网络设计的基本原则和方法。

理解动态路由协议OSP℉的工作原理；掌握采用动态路由协议OSPF进行网络设计的基本原则和方法。

2 实验条件

设备：PC 机一台，连入局域网

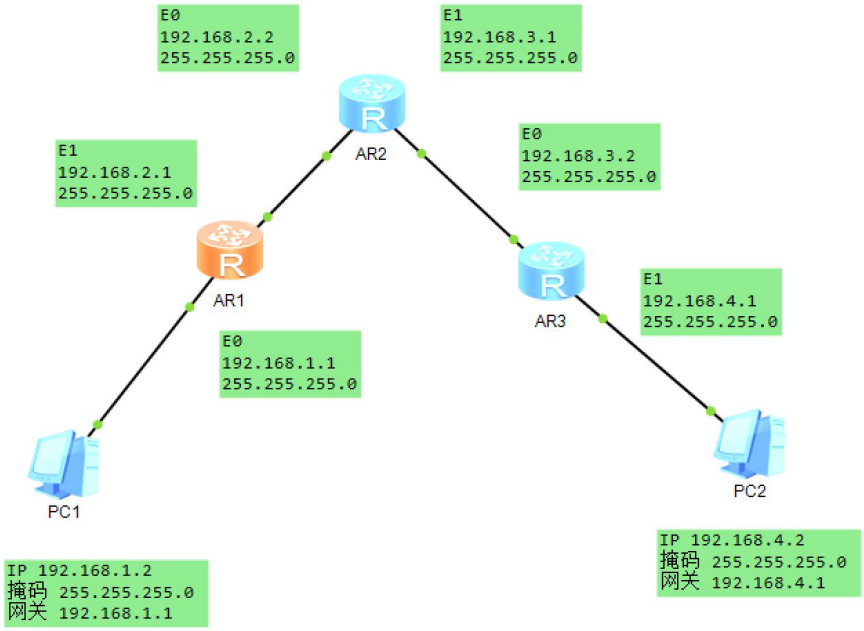
所用工具：VirtualBox、Wireshark、eNSP、WinPcap

3 实验报告内容及原理

3、1 静态路由

1）、硬件连接，完成PC1、PC2到路由器的网络连接；PC1到路由器RT1控制线的连接，PC2到路由器RT2控制线的连接。

2）、为PC1、PC2分别设置P地址、掩码和网关。

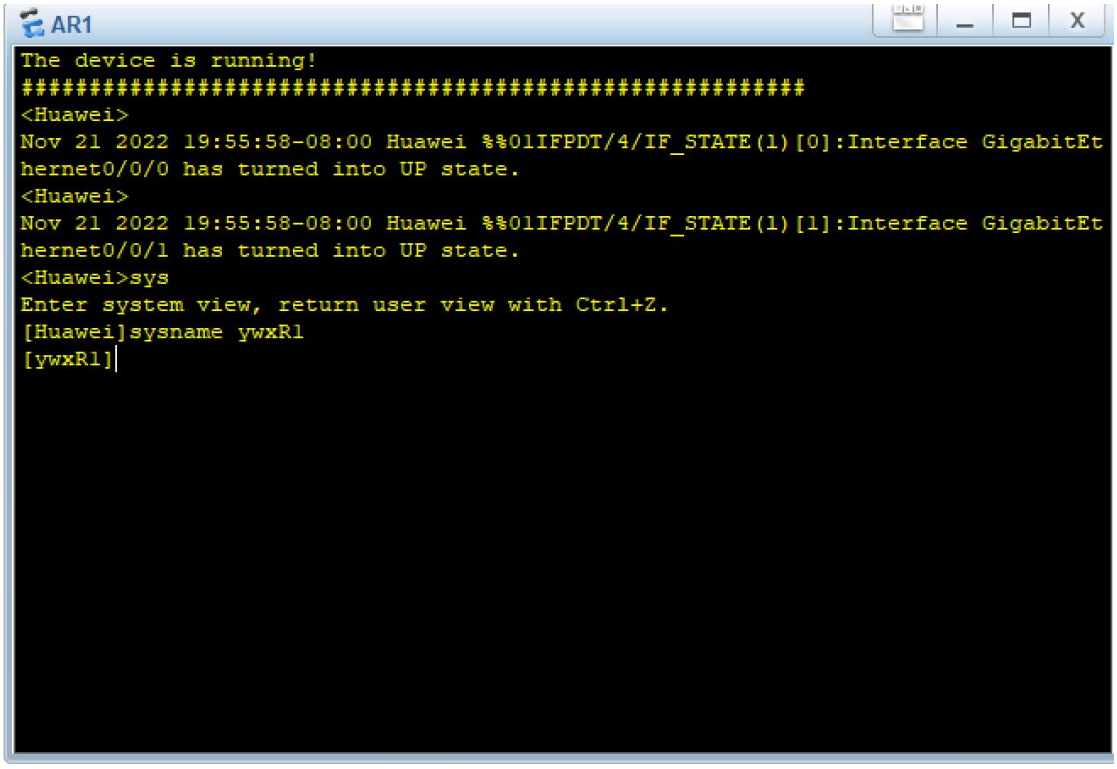


3）、使用sysname命令为三个路由器命名。路由器R1的名称为学生自己的姓名拼音+R1,路由器R2的名称为学生自己的姓名拼音+R2,路由器R3的名称为学生自己的姓名拼音+R3。

命令（以R1为例）：

sys

Sysname ywxR1



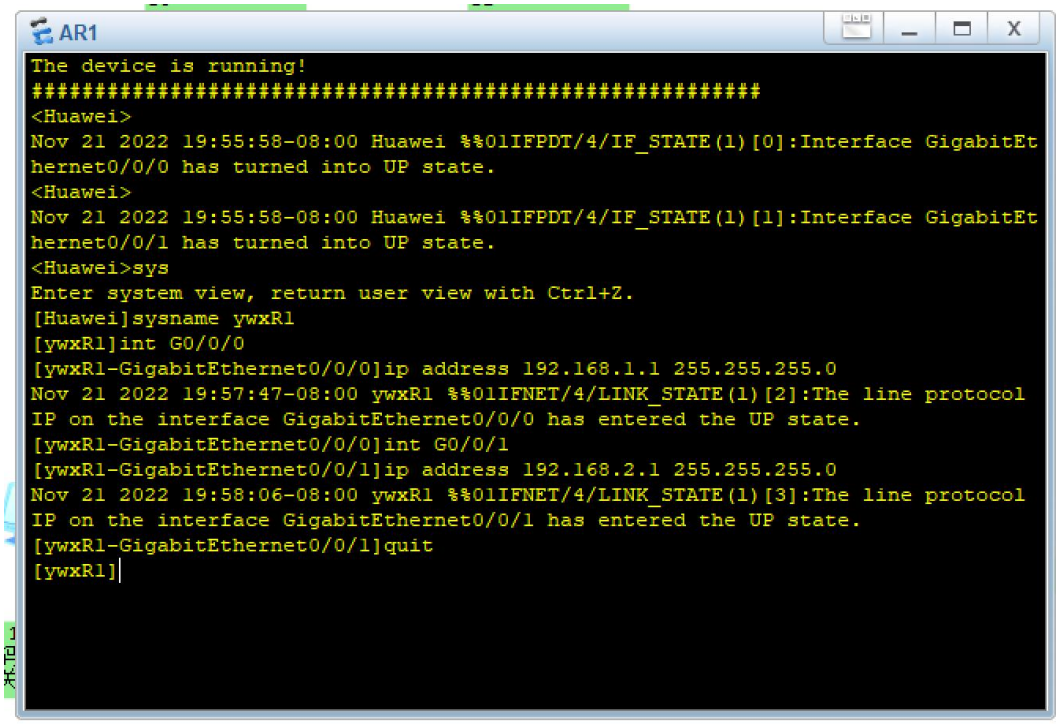
4）、为路由器R1的两个接口配置P地址。配置完成后PC1应该可以Pg通RT1

的E0口的地址。要求记录输入的命令和输出。

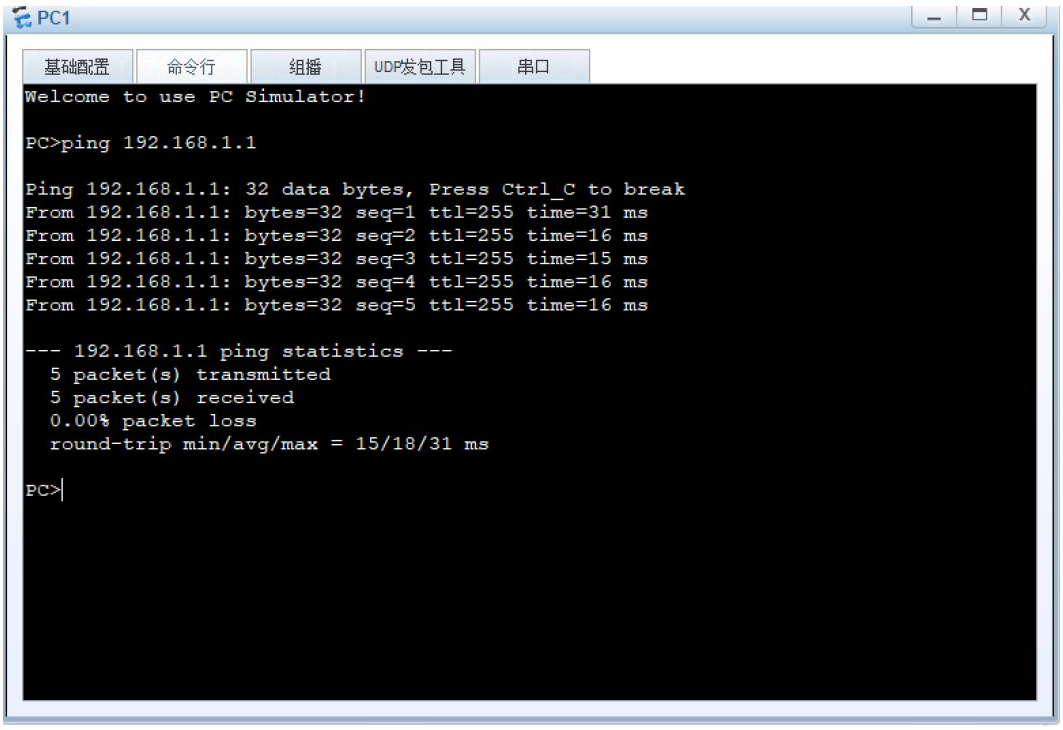
命令：

int G0/0/0

Ip address 192.168.1.1 255.255.255.0

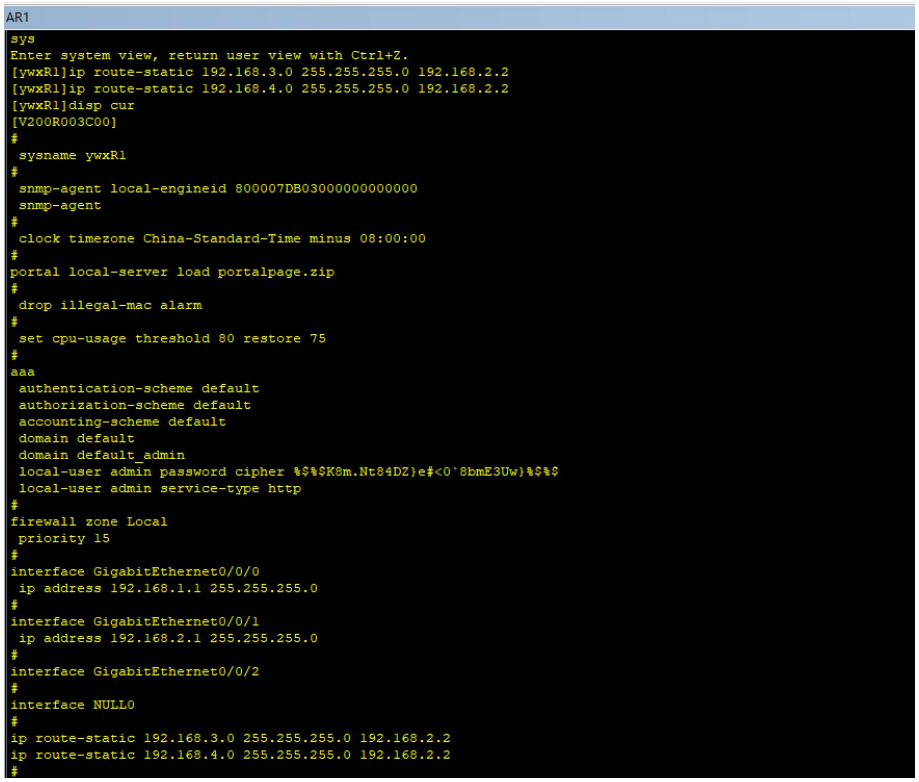


5）、执行ping命令，检查是否连通

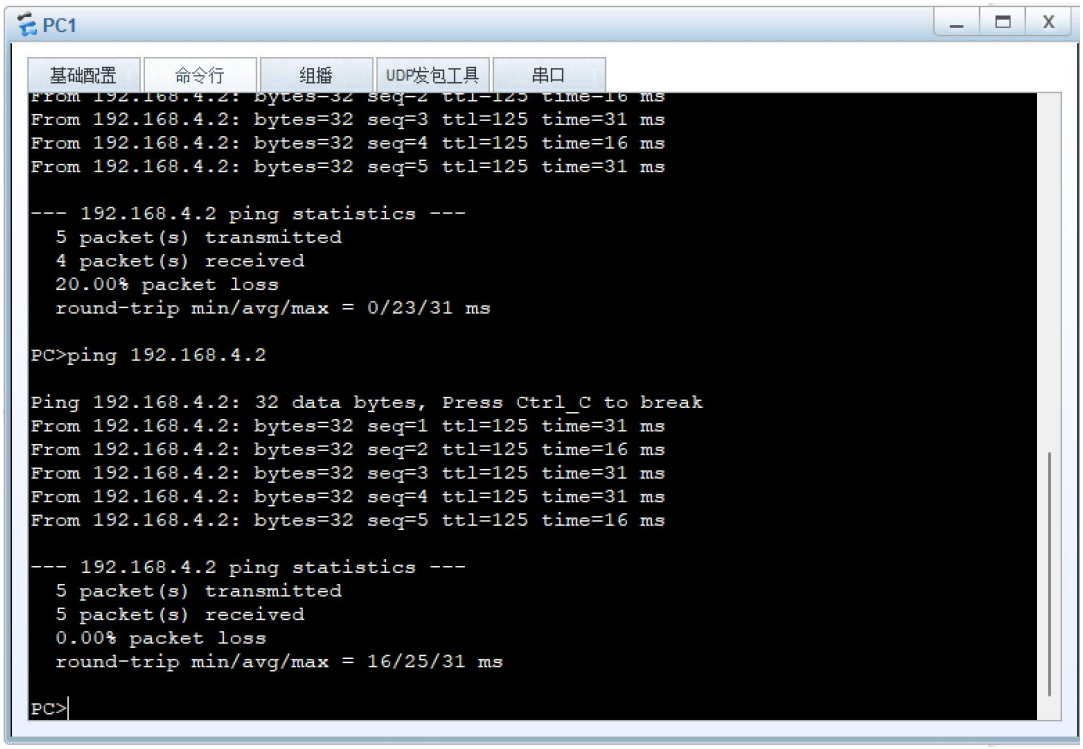


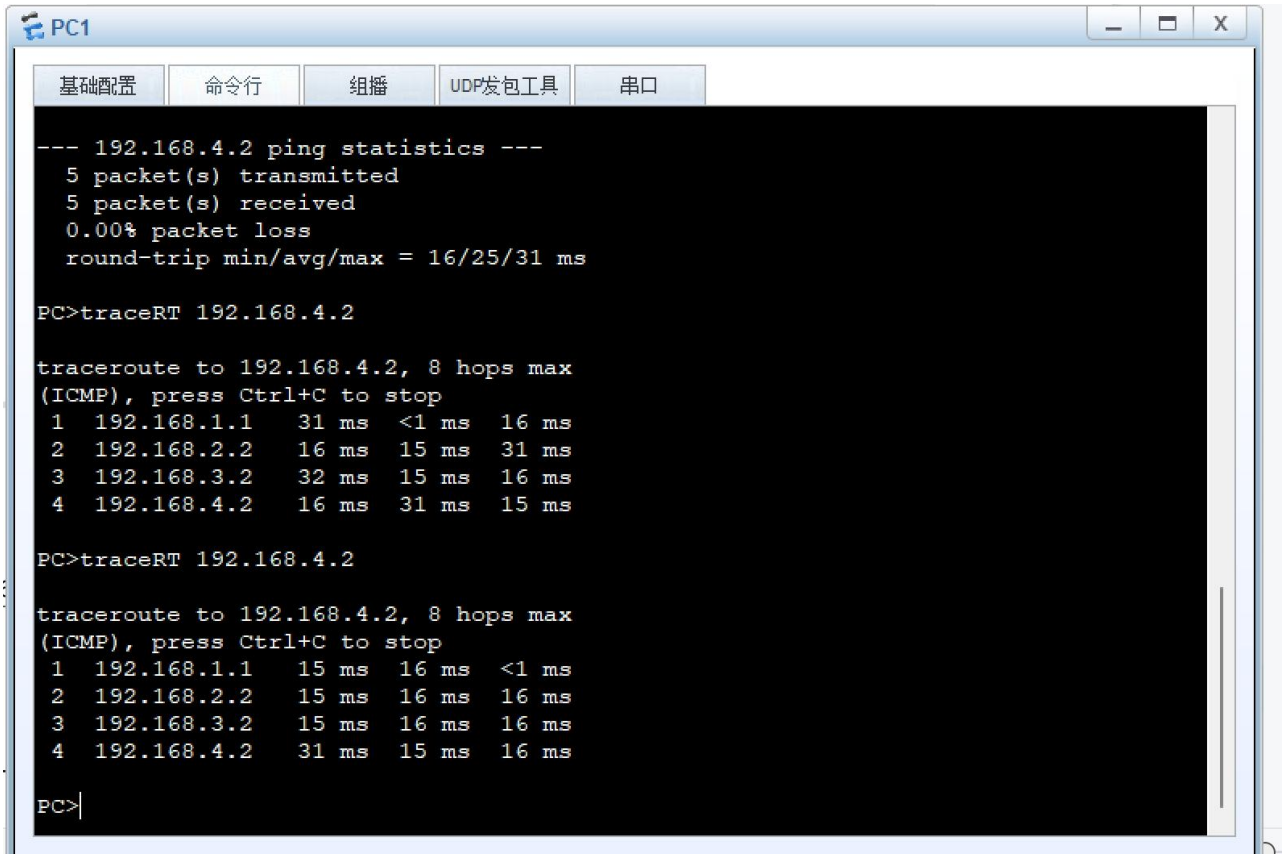
6）、为三个路由器分别从左至右配置静态路由。配置后可以用disp cur检查配置，或者disp ip route检查路由表。要求记录输入的命令和输出

命令：ip route-static 192.168.3.0 255.255.255.0 192.168.2.2

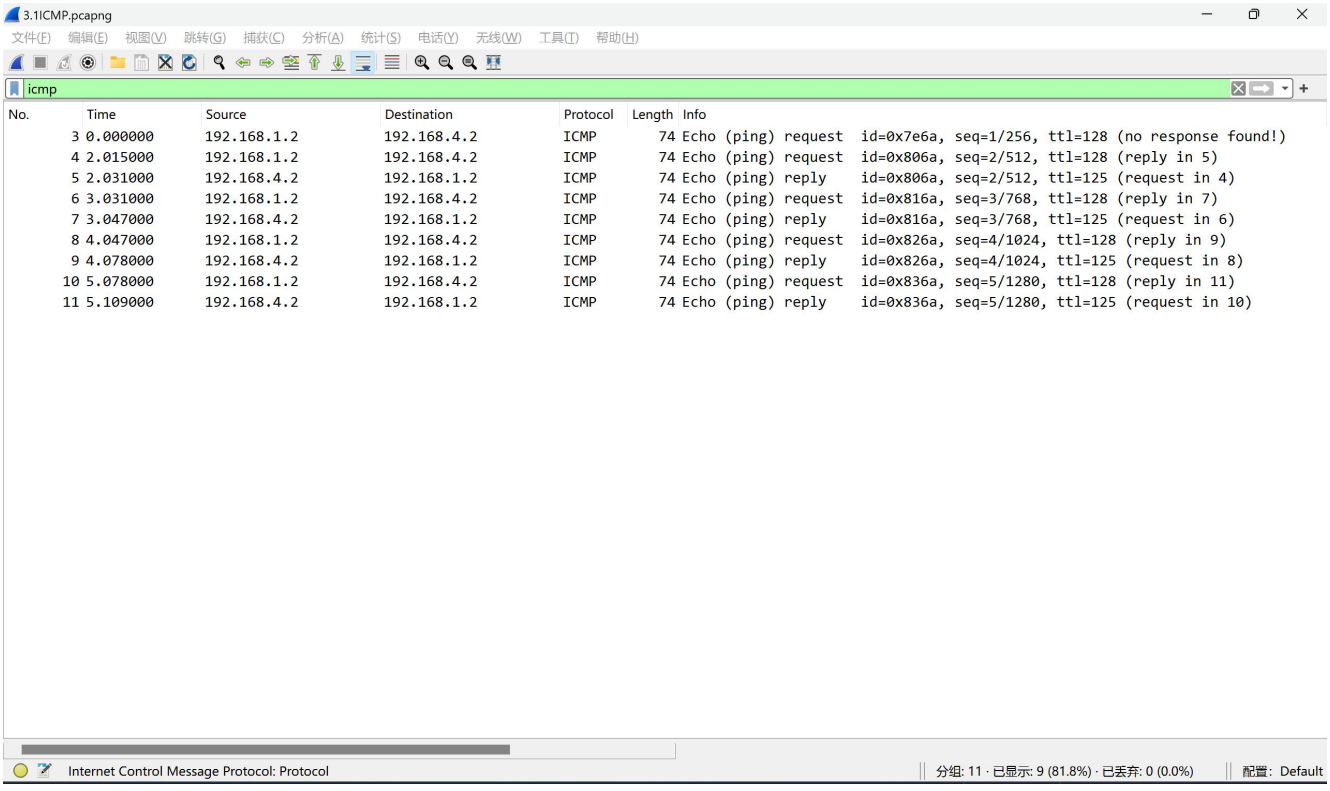


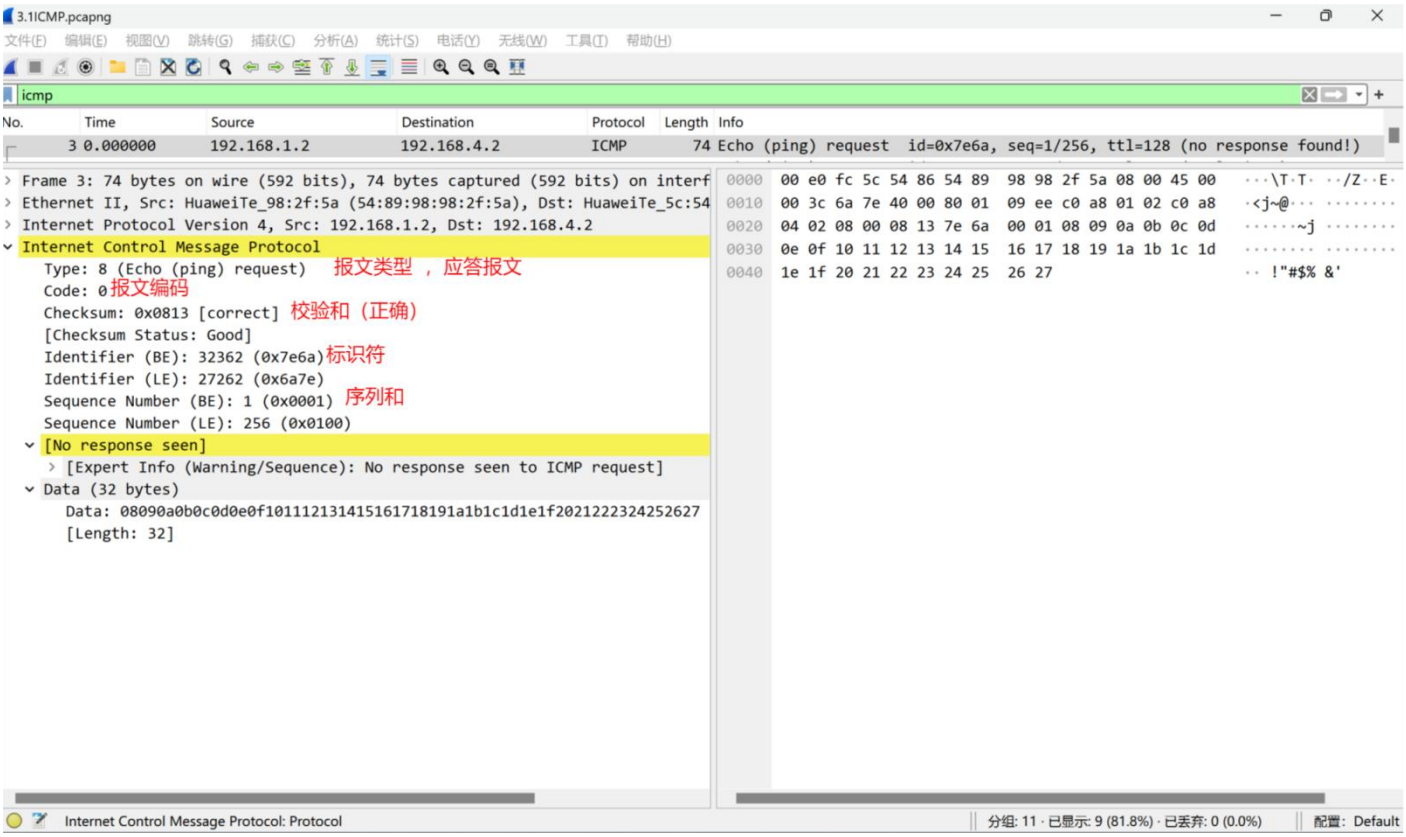
7）、如配置正确，此时网络收敛，则任何两点之间（含非直连)均可ping通，分别使用ping命令和traceRT命令来验证。





8）(选做)在PC1上使用抓包工具进行抓包。首先使用arp-d命令清空arp表。再使用Ping命令测试到PC2的连通性。分析抓到的ping命令的icmp报文。

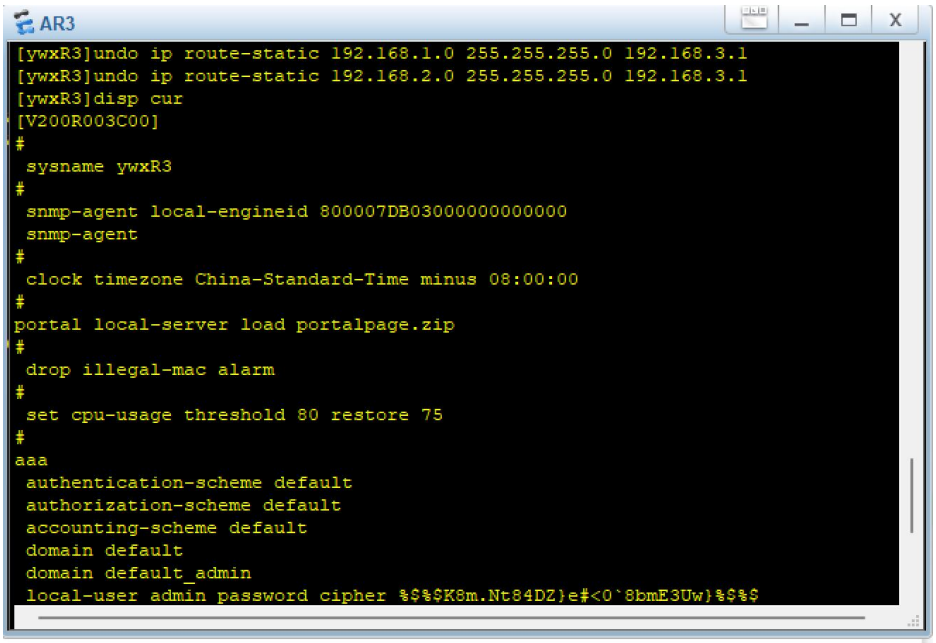




3、2 动态路由（RIP）（接在3.1后继续进行）

1）、为3个路由器配置动态路由协议rip,首先删除原来的静态路由配置。配置后可以用display current configuration检查配置，或者display ip routing-table检查路由表。

删除路由命令：undo ip route-tatic 192.168.1.0 255.255.255.0 192.168.3.1



添加rip命令：

rip

network 192.168.1.0

network 192.168.2.0

```
AR1

[ywxR1]rip
[ywxR1-rip-1]network 192.168.1.0
[ywxR1-rip-1]network 192.168.2.0
[ywxR1-rip-1]disp cur
[V200R003C00]
#
 sysname ywxR1
#
 snmp-agent local-engineid 800007DB03000000000000
 snmp-agent
#
 clock timezone China-Standard-Time minus 08:00:00
#
portal local-server load portalpage.zip
#
 drop illegal-mac alarm
#
 set cpu-usage threshold 80 restore 75
#
aaa
 authentication-scheme default
 authorization-scheme default
 accounting-scheme default
 domain default
 domain default_admin
 local-user admin password cipher %$%$K8m.Nt84DZ}e#<0`8bmE3Uw}%$%$
 local-user admin service-type http
#
firewall zone Local
 priority 15
#
interface GigabitEthernet0/0/0
 ip address 192.168.1.1 255.255.255.0
#
interface GigabitEthernet0/0/1
 ip address 192.168.2.1 255.255.255.0
#
interface GigabitEthernet0/0/2
#
interface NULL0
#
rip 1
 network 192.168.1.0
 network 192.168.2.0
#
```

2）、为3个路由器分别配置动态路由协议rip。配置后可以用disp cur检查配置，或者disp ip routing-table检查路由表。配置完成后，网络收敛，则网络任意两点间，应该可以互相Ping通。

AR1:

```
[ywxR1-rip-1]display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 12        Routes : 12

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

      127.0.0.0/8   Direct  0    0           D   127.0.0.1       InLoopBack0
      127.0.0.1/32  Direct  0    0           D   127.0.0.1       InLoopBack0
127.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0
    192.168.1.0/24  Direct  0    0           D   192.168.1.1     GigabitEthernet
0/0/0
    192.168.1.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/0
  192.168.1.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/0
    192.168.2.0/24  Direct  0    0           D   192.168.2.1     GigabitEthernet
0/0/1
    192.168.2.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/1
  192.168.2.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/1
    192.168.3.0/24  RIP     100  1           D   192.168.2.2     GigabitEthernet
0/0/1
    192.168.4.0/24  RIP     100  2           D   192.168.2.2     GigabitEthernet
0/0/1
255.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0

[ywxR1-rip-1]
```

AR2:

```
[ywxR2-rip-1]display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 12        Routes : 12

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

      127.0.0.0/8   Direct  0    0           D   127.0.0.1       InLoopBack0
      127.0.0.1/32  Direct  0    0           D   127.0.0.1       InLoopBack0
127.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0
    192.168.1.0/24  RIP     100  1           D   192.168.2.1     GigabitEthernet
0/0/0
    192.168.2.0/24  Direct  0    0           D   192.168.2.2     GigabitEthernet
0/0/0
    192.168.2.2/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/0
  192.168.2.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/0
    192.168.3.0/24  Direct  0    0           D   192.168.3.1     GigabitEthernet
0/0/1
    192.168.3.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/1
  192.168.3.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/1
    192.168.4.0/24  RIP     100  1           D   192.168.3.2     GigabitEthernet
0/0/1
255.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0

[ywxR2-rip-1]
```

AR3:

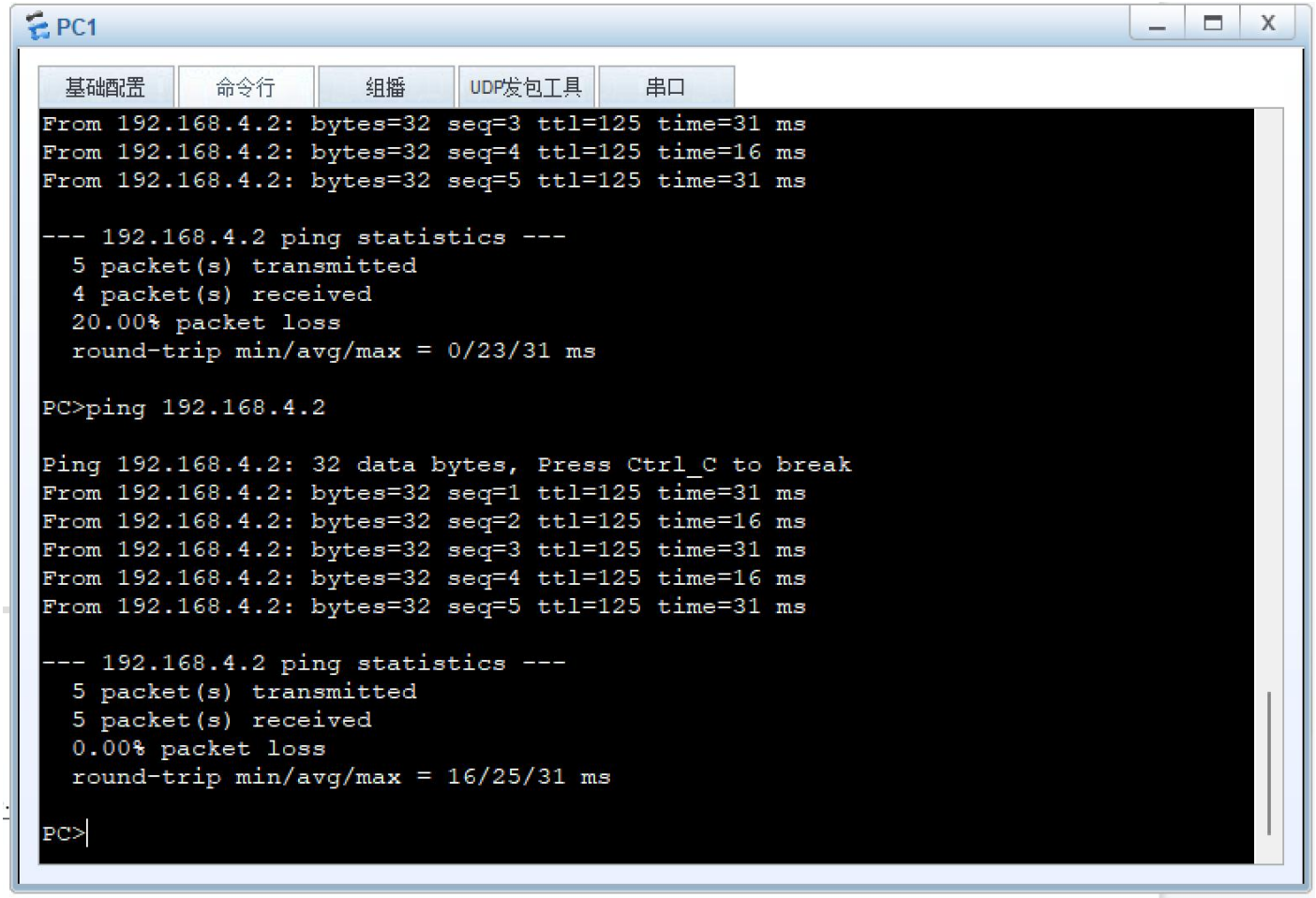
```
[ywxR3-rip-1]display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 12        Routes : 12

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

      127.0.0.0/8   Direct  0    0           D   127.0.0.1       InLoopBack0
      127.0.0.1/32  Direct  0    0           D   127.0.0.1       InLoopBack0
127.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0
    192.168.1.0/24  RIP     100  2           D   192.168.3.1     GigabitEthernet
0/0/0
    192.168.2.0/24  RIP     100  1           D   192.168.3.1     GigabitEthernet
0/0/0
    192.168.3.0/24  Direct  0    0           D   192.168.3.2     GigabitEthernet
0/0/0
    192.168.3.2/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/0
  192.168.3.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/0
    192.168.4.0/24  Direct  0    0           D   192.168.4.1     GigabitEthernet
0/0/1
    192.168.4.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/1
  192.168.4.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/1
255.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0

[ywxR3-rip-1]
```

3）PC1对PC2进行ping命令，查看是否能ping通



3.3 动态路由（ospf）

4）、为3个路由器配置动态路由协议ospf,首先删除原来的rip配置。配置后可以用display current configuration检查配置，或者display ip routing-table检查路由表。

删除路由命令：undo rip 1（注意计算机自动分配rip 1）

5）、为3个路由器分别配置动态路由协议ospf。配置后可以用disp cur检查配置，或者disp ip routing-table检查路由表。配置完成后，网络收敛，则网络任意两点间，应该可以互相Ping通。

添加ospf命令：ospf

area 0

network 192.168.3.0 0.0.0.255

network 192.168.4.0 0.0.0.255

AR1：

```
[ywxR1]display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 12        Routes : 12

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

      127.0.0.0/8   Direct  0    0           D   127.0.0.1       InLoopBack0
      127.0.0.1/32  Direct  0    0           D   127.0.0.1       InLoopBack0
127.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0
    192.168.1.0/24  Direct  0    0           D   192.168.1.1     GigabitEthernet
0/0/0
    192.168.1.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/0
  192.168.1.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/0
    192.168.2.0/24  Direct  0    0           D   192.168.2.1     GigabitEthernet
0/0/1
    192.168.2.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/1
  192.168.2.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/1
    192.168.3.0/24  OSPF    10   2           D   192.168.2.2     GigabitEthernet
0/0/1
    192.168.4.0/24  OSPF    10   3           D   192.168.2.2     GigabitEthernet
0/0/1
255.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0

[ywxR1]
```

AR2：

```
[ywxR2]display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 12        Routes : 12

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

      127.0.0.0/8   Direct  0    0           D   127.0.0.1       InLoopBack0
      127.0.0.1/32  Direct  0    0           D   127.0.0.1       InLoopBack0
127.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0
    192.168.1.0/24  OSPF    10   2           D   192.168.2.1     GigabitEthernet
0/0/0
    192.168.2.0/24  Direct  0    0           D   192.168.2.2     GigabitEthernet
0/0/0
    192.168.2.2/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/0
  192.168.2.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/0
    192.168.3.0/24  Direct  0    0           D   192.168.3.1     GigabitEthernet
0/0/1
    192.168.3.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/1
  192.168.3.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/1
    192.168.4.0/24  OSPF    10   2           D   192.168.3.2     GigabitEthernet
0/0/1
255.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0

[ywxR2]
```

AR3:

```
[ywxR3]display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 12        Routes : 12

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

      127.0.0.0/8   Direct  0    0           D   127.0.0.1       InLoopBack0
      127.0.0.1/32  Direct  0    0           D   127.0.0.1       InLoopBack0
127.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0
    192.168.1.0/24  OSPF    10   3           D   192.168.3.1     GigabitEthernet
0/0/0
    192.168.2.0/24  OSPF    10   2           D   192.168.3.1     GigabitEthernet
0/0/0
    192.168.3.0/24  Direct  0    0           D   192.168.3.2     GigabitEthernet
0/0/0
    192.168.3.2/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/0
  192.168.3.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/0
    192.168.4.0/24  Direct  0    0           D   192.168.4.1     GigabitEthernet
0/0/1
    192.168.4.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/1
  192.168.4.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/1
255.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0

[ywxR3]
```

6）PC1对PC2进行ping命令，查看是否能ping通

PC1

基础配置 | 命令行 | 组播 | UDP发包工具 | 串口

```
From 192.168.4.2: bytes=32 seq=3 ttl=125 time=16 ms
From 192.168.4.2: bytes=32 seq=4 ttl=125 time=31 ms
From 192.168.4.2: bytes=32 seq=5 ttl=125 time=15 ms

--- 192.168.4.2 ping statistics ---
  5 packet(s) transmitted
  4 packet(s) received
  20.00% packet loss
  round-trip min/avg/max = 0/19/31 ms

PC>ping 192.168.4.2

Ping 192.168.4.2: 32 data bytes, Press Ctrl_C to break
From 192.168.4.2: bytes=32 seq=1 ttl=125 time=31 ms
From 192.168.4.2: bytes=32 seq=2 ttl=125 time=15 ms
From 192.168.4.2: bytes=32 seq=3 ttl=125 time=16 ms
From 192.168.4.2: bytes=32 seq=4 ttl=125 time=15 ms
From 192.168.4.2: bytes=32 seq=5 ttl=125 time=32 ms

--- 192.168.4.2 ping statistics ---
  5 packet(s) transmitted
  5 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 15/21/32 ms

PC>
```

4 实验结论及心得体会

此次实验，最终进行了两次才成功，第一次实验，在进行ping命令的时候，最终没有ping成功，怀疑是某个路由的接口设置错误，最终，重新画了一次拓扑图，但是这样比较浪费精力。在第二次中，同样出现了ping不通的问题，但是这次，通过，每一个连接的路由分别ping其旁边的路由，来通过查看是否能ping通，再辅以通过命令disp cur，来查看路由的详细信息，就可以发现最终问题在哪个路由的设置上了，那么就可以通过该一个路由来解决问题，这样就大大提高了改错的效率。