

# 廈門大學



## 信息学院软件工程系

### 《计算机网络》实验报告

题    目 实验四  CISCO IOS 路由器基本配置

班    级 软件工程 2020 级卓越班

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# 填写说明

- 1、本文件为 Word 模板文件，建议使用 Microsoft Word 2019 打开，在可填写的区域中如实填写；
- 2、填表时勿破坏排版，勿修改字体字号，打印成 PDF 文件提交；
- 3、文件总大小尽量控制在 1MB 以下，最大勿超过 5MB；
- 4、应将材料清单上传在代码托管平台上；
- 5、在实验课结束 14 天内，按原文件发送至课程 FTP 指定位置。

## 1 实验目的

通过完成实验，理解网络层和路由的基本原理。掌握路由器配置网络和组网的方法；掌握 IP 协议、IP 地址配置和路由的概念；掌握 IP 协议和路由的基本原理；了解在模拟器下根据教程配置网络的方法。

## 2 实验环境

操作系统：Windows 10；CCNA Network Visualizer 6.0、Router eSIM v1.1、思科模拟器 Packet Tracer 7.0

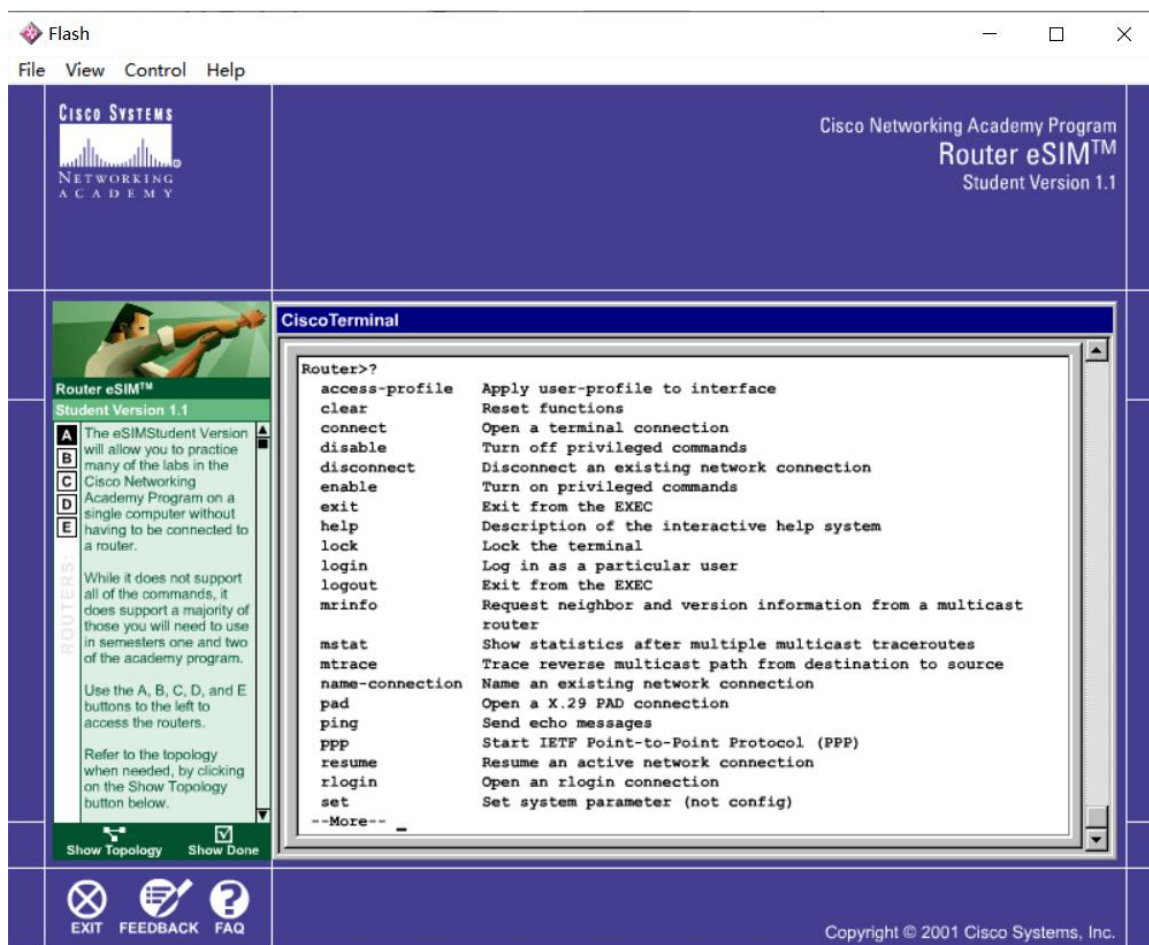
## 3 实验结果

### 1、使用 Router eSIM v1.1 模拟器来模拟路由器的配置环境

Router 是路由器的名字，可以通过 `hostname` 命令改变。有时路由器后面紧跟一个括号，括号内的字符串用来表明路由器的配置模式，如 `Router(config)#` 中的 `(config)` 表示路由器处在全局配置模式下。`(config-if)` 表示路由器处于接口配置模式。`>` 和 `#` 则表示路由器目前处于普通用户模式还是超级用户模式。

`Router(config-subif)#` 表示路由器 Router 目前处于子接口配置模式下。

#### ① 查询可以使用的命令



② 进入超级用户模式，在超级用户模式下，显示当前配置，显示配置接口，显示版本号和路由器信息

(1) show running-config 显示当前运行状态的配置。保存命令为 copy running-config startup-config。

(2) show interfaces 命令显示了各接口的配置参数和工作数据。该命令对于差错检验和确定故障所在都很有帮助。

(3) show version 显示当前运行在路由器上的 Cisco IOS 的版本号、路由器的型号，这里的 IOS 版本号是 12.0，路由器的型号为 Cisco 2500。

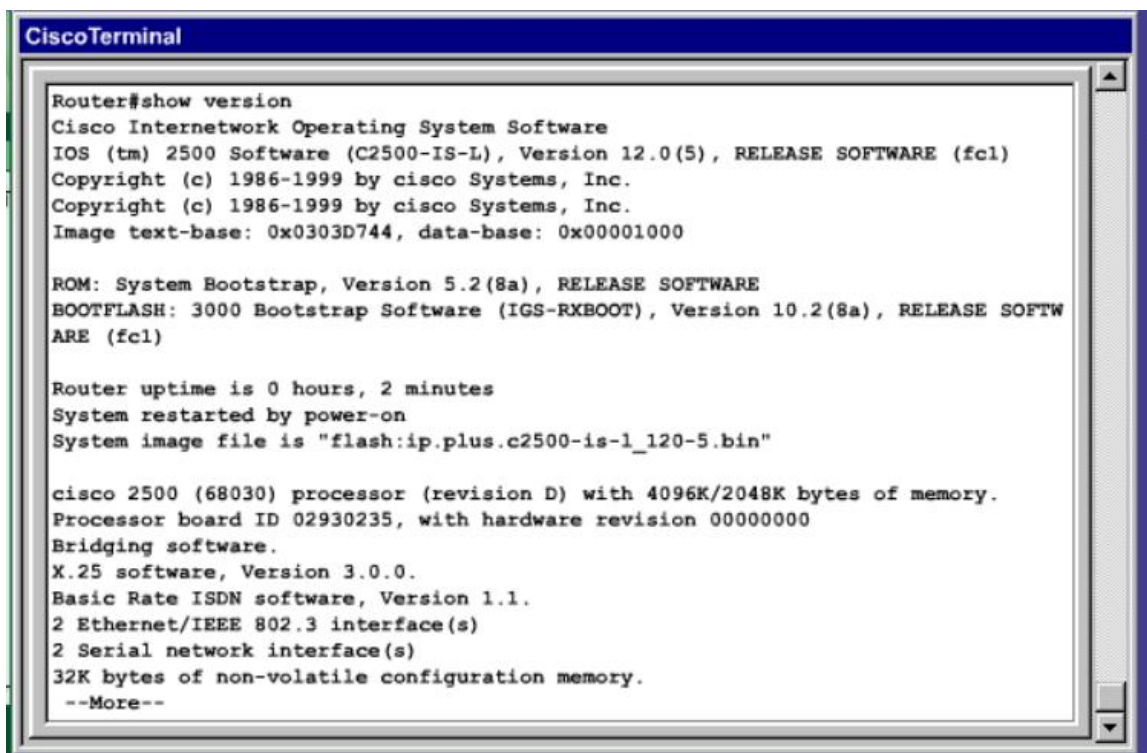
```
CiscoTerminal

Router>enable
Router#show running-config
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router
!
enable password
!
!
ip subnet-zero
!
!
!
interface Ethernet0
 no ip address
 shutdown
!
```

```
CiscoTerminal

Router#show interfaces
Ethernet0 is administratively down, line protocol is down
  Hardware is Lance, address is 0010.7b81.4e2c(bia 0010.7b81.4e2c)
  MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec,
    reliability 252/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output 00:00:20, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts, 0 runs, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
  0 input packets with dribble condition detected
  6 packets output, 360 bytes, 0 underruns
  6 output errors, 0 collisions, 3 interface resets
  0 babbles, 0 late collision, 0 deferred
  6 lost carrier, 0 no carrier
  0 output buffer failures, 0 output buffers swapped out
--More--
```



```

CiscoTerminal
Router#show version
Cisco Internetwork Operating System Software
IOS (tm) 2500 Software (C2500-IS-L), Version 12.0(5), RELEASE SOFTWARE (fc1)
Copyright (c) 1986-1999 by cisco Systems, Inc.
Copyright (c) 1986-1999 by cisco Systems, Inc.
Image text-base: 0x0303D744, data-base: 0x00001000

ROM: System Bootstrap, Version 5.2(8a), RELEASE SOFTWARE
BOOTFLASH: 3000 Bootstrap Software (IGS-RXBOOT), Version 10.2(8a), RELEASE SOFTWARE (fc1)

Router uptime is 0 hours, 2 minutes
System restarted by power-on
System image file is "flash:ip.plus.c2500-is-l_120-5.bin"

cisco 2500 (68030) processor (revision D) with 4096K/2048K bytes of memory.
Processor board ID 02930235, with hardware revision 00000000
Bridging software.
X.25 software, Version 3.0.0.
Basic Rate ISDN software, Version 1.1.
2 Ethernet/IEEE 802.3 interface(s)
2 Serial network interface(s)
32K bytes of non-volatile configuration memory.
--More--

```

### ③ 更改配置路由器等内容

#### (1) 对第一台路由器进行改名

路由器出厂的名字都默认为 Router，为了区分网络中的各个路由器，要给路由器取名字，通常会将路由器的摆放地点表现到名字中。在全局配置模式下用 hostname 改变路由器的名字。IOS 会将这个名字显示在 IOS 的名字提示符中。

```

Router#config t
Enter configuration commands, one per line. End with END.
Router(config)#hostname lab_A

```

#### (2) 设置当日消息标题

设置当日的消息标题的命令是 banner motd，是将#……#之间的文本在各终端试图访问路由器时，在登录口令之前显示出来，可以用它来通知系统关闭等信息。

```

lab_A(config)#banner motd #
Enter TEXT message. End with the character '#'.
Accounting Department
#

```

#### (3) 建立 IP 地址映射表

可以在路由器内建立一个 IP 地址的映射表，静态指定机器名和 IP 地址的映射关系，这样可以通过机器名和 IP 地址两种方式指定计算机、交换机和路由器的接口。路由器 lab\_A 上配置了名字解析的两个条目。如果在路由器 lab\_A 上想和 lab\_D 机器进行联系（lab\_D 可能是计算机、交换机或路由器的接口），路由器将首先试图和 IP 地址为 210.93.105.1 的机器进行联系，如果联系不上，再与 IP 地址为 204.204.7.2 的机器联系，这样可以通过机器名和 IP 地址两种方式指定计算机、交换机和路由器的接口。

```
lab_A(config)#ip host lab_A 192.5.5.1 205.7.5.1 201.100.11.1
lab_A(config)#ip host lab_B 219.17.100.1 199.6.13.1 201.100.11.2
lab_A(config)#ip host lab_C 223.8.151.1 204.204.7.1 199.6.13.2
lab_A(config)#ip host lab_D 210.93.105.1 204.204.7.2
lab_A(config)#ip host lab_E 210.93.105.2
```

#### (4) 为路由器的一个接口配置 IP 地址

在该接口上启动 IP 进程。这个 IP 地址也是该接口所连接的子网的网关。

```
lab_A(config)#int eth 0
lab_A(config-if)#ip address 192.5.5.1 255.255.255.0
lab_A(config-if)#int eth 1
lab_A(config-if)#ip address 205.7.5.1 255.255.255.0
lab_A(config-if)#int serial 0
lab_A(config-if)#ip address 201.100.11.1 255.255.255.0
```

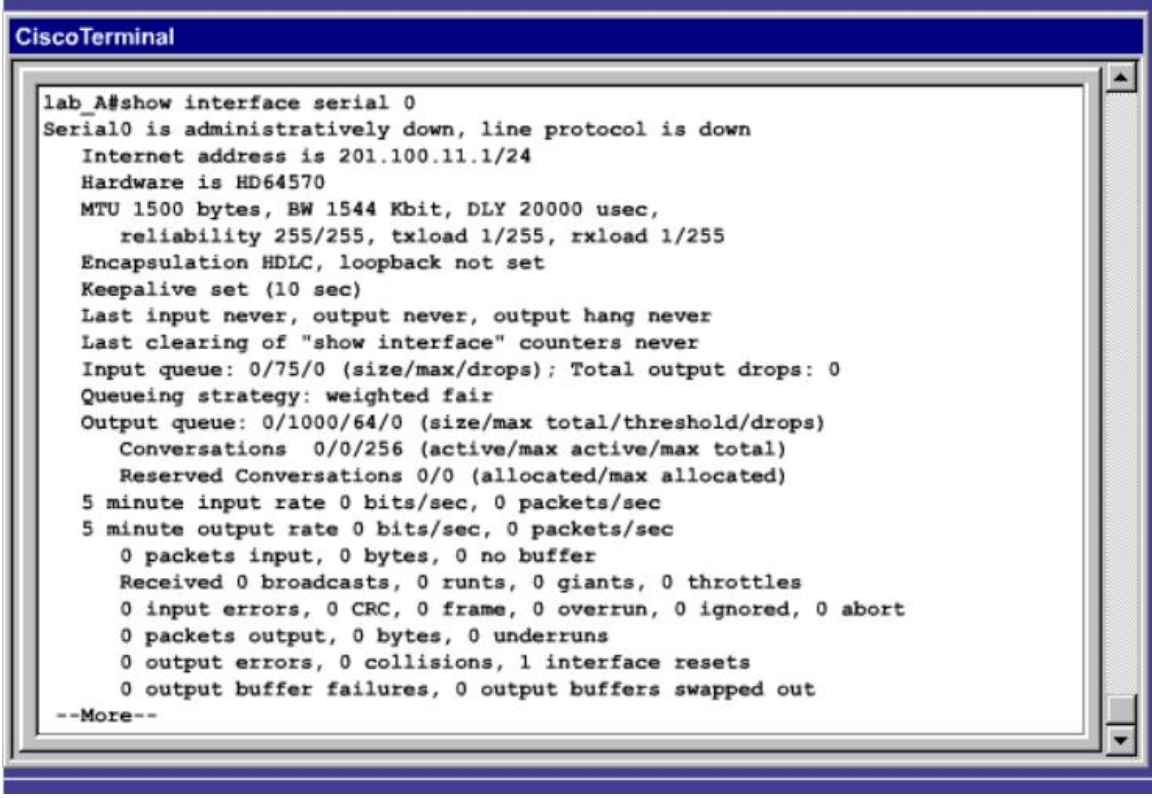
#### (5) 配置充当 DCE 端的串行端口

在串行端口连接中，作为 DCE 的一端必须为连接的另一端 DTE 提供时钟信号。默认情况下，Cisco 的路由器串行端口充当 DTE 设备，如果要配置成 DCE 端口，必须用 clock rate 指定时钟频率，也只有 DCE 端口才需要配置。

```
lab_A(config-if)#clock rate 56000
lab_A(config-if)#
```

#### (6) 查看端口配置情况





```
CiscoTerminal
lab_A#show interface serial 0
Serial0 is administratively down, line protocol is down
  Internet address is 201.100.11.1/24
  Hardware is HD64570
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
  Last input never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
    Conversations 0/0/256 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 collisions, 1 interface resets
    0 output buffer failures, 0 output buffers swapped out
--More--
```

### (7) 开启路由器接口

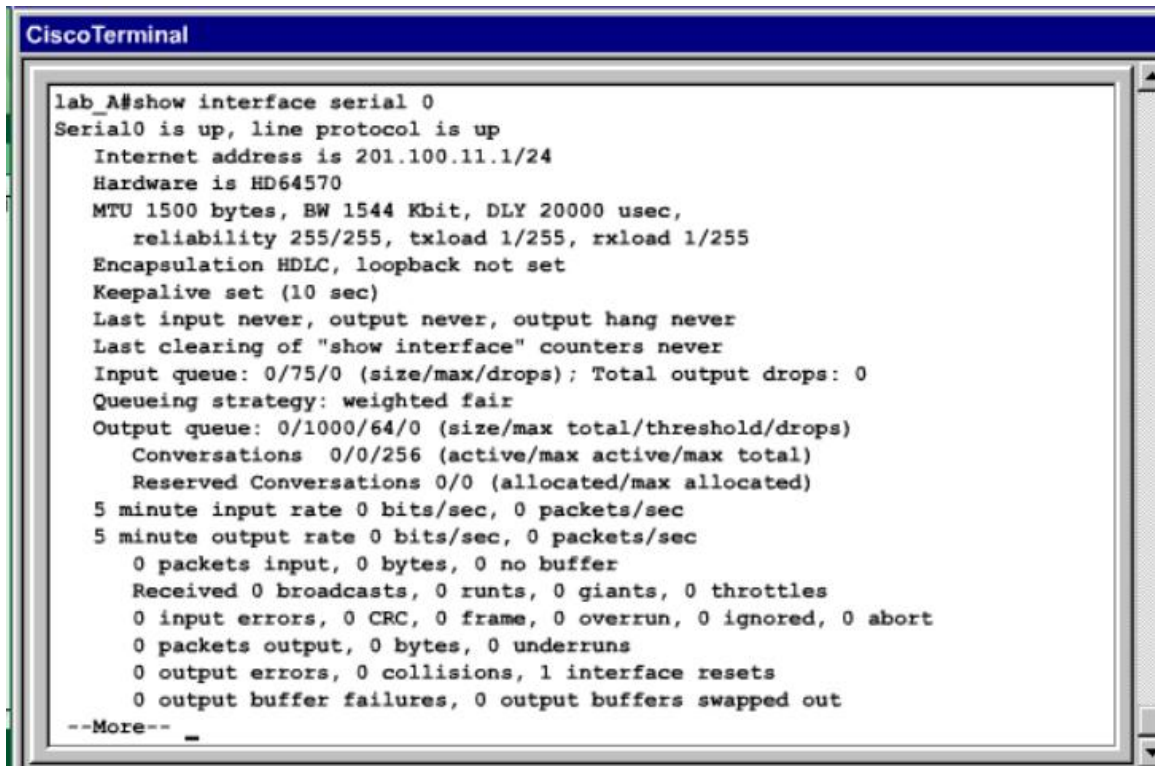
输入“confi term”进入全局配置模式，比如给路由器改名字这样的对路由器整体起作用的配置必须要在全局模式下进行。如果是对路由器的各端口（如 Ethernet 端口）进行配置，则要在全局模式下输入相应命令，进入配置模式。

当路由器接口被管理员手工关闭或路由器刚出场时，需要手工开启端口，输入 no shut down 即可。

```
lab_A#configure term
Enter configuration commands, one per line. End with END.
lab_A(config)#interface serial 0
lab_A(config-if)#no shutdown
```

### (8) Show 查看成功配置情况

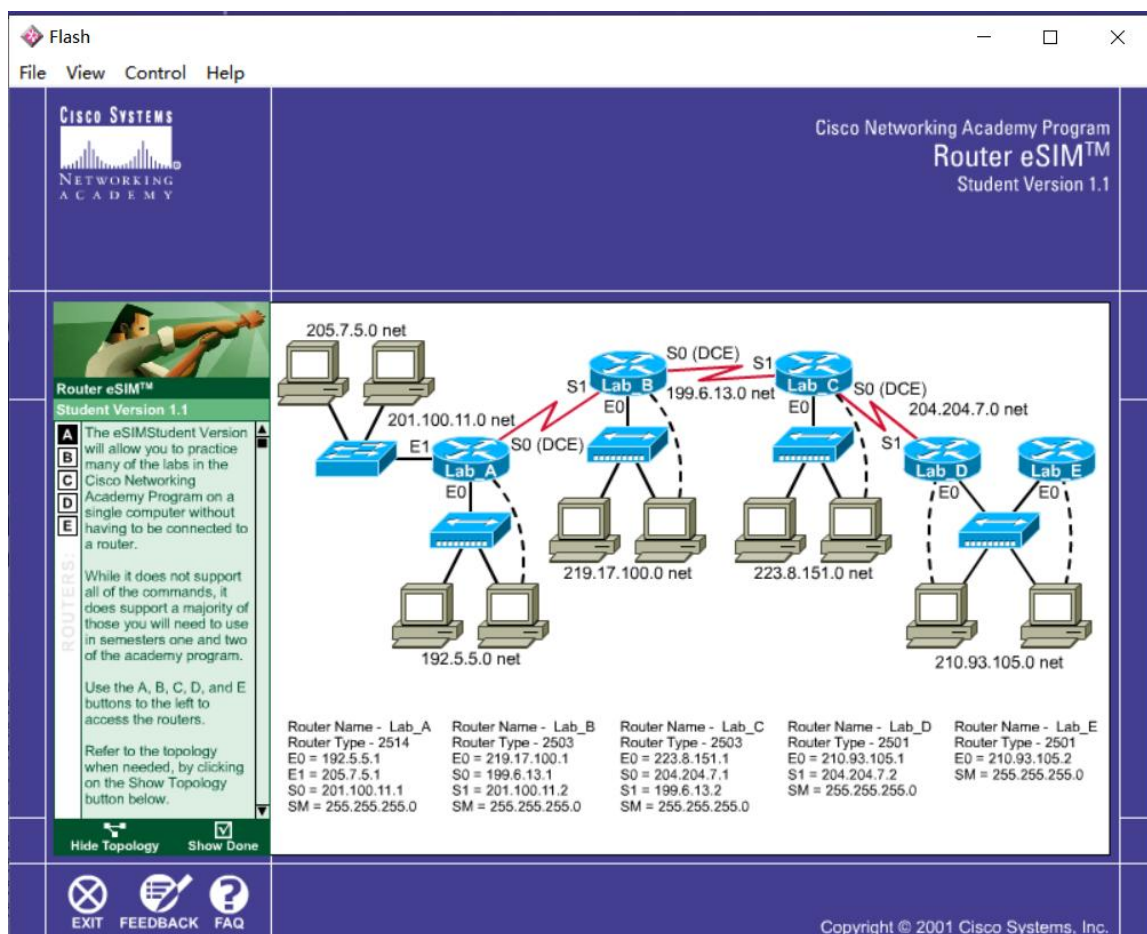




```
CiscoTerminal

lab_A#show interface serial 0
Serial0 is up, line protocol is up
  Internet address is 201.100.11.1/24
  Hardware is HD64570
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
    Conversations 0/0/256 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 collisions, 1 interface resets
    0 output buffer failures, 0 output buffers swapped out
--More--
```

(9) 查看拓扑图



(10) 超级用户口令、手动打开和关闭接口与其他配置

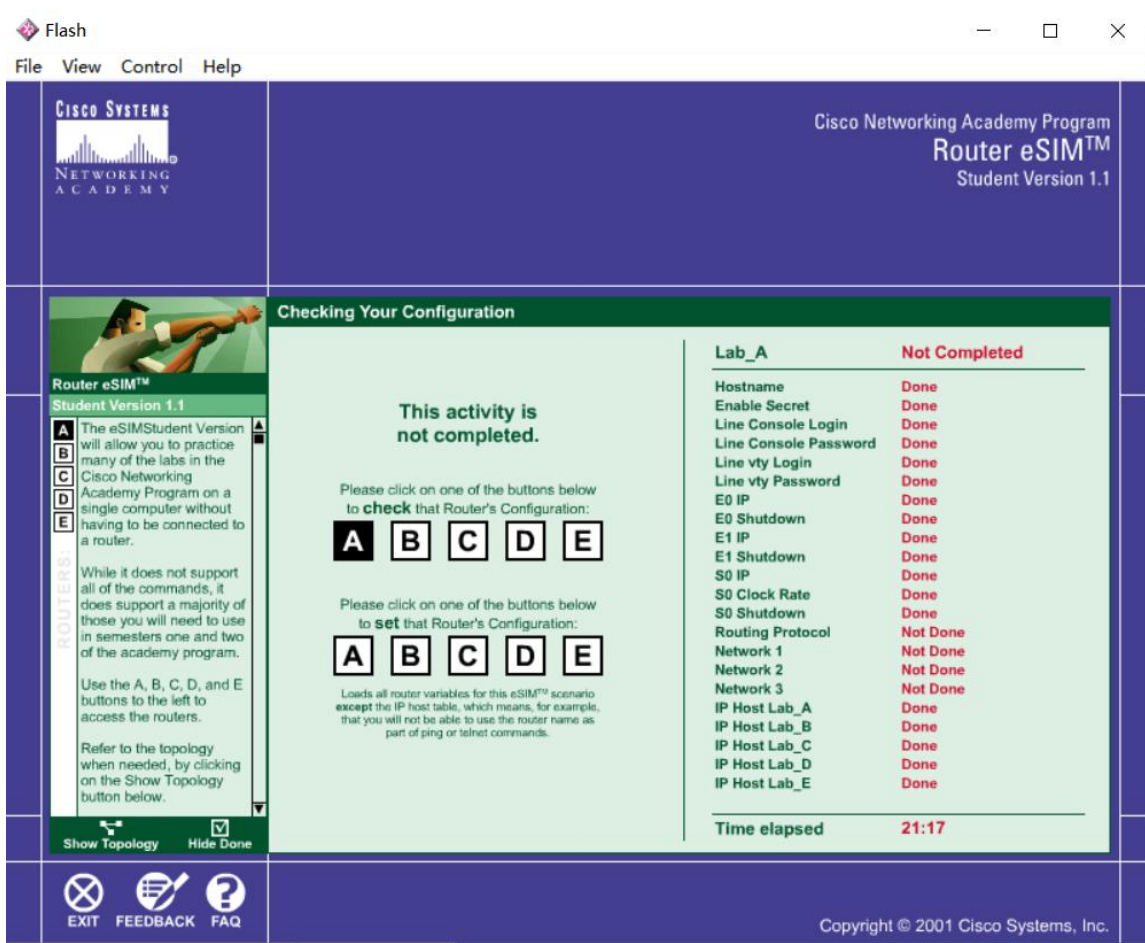
```
lab_A(config)#enable secret class
lab_A(config)#interface serial 0
lab_A(config-if)#no shutdown
lab_A(config-if)#shutdown
lab_A(config-if)#no shutdown
lab_A(config-if)#exit
lab_A(config)#interface ethernet 1
lab_A(config-if)#shutdown
lab_A(config-if)#no shutdown
lab_A(config-if)#exit
lab_A(config)#interface ethernet 0
lab_A(config-if)#no shutdown
lab_A(config-if)#exit
```

```

lab_A(config)#interface ethernet 0
lab_A(config-if)#description engineering LAN,Bldg,18
lab_A(config-if)#exit
lab_A(config)#line console 0
lab_A(config-line)#login
lab_A(config-line)#password cisco
lab_A(config-line)#exit
lab_A(config)#line vty 0 4
lab_A(config-line)#login
lab_A(config-line)#password software
lab_A(config-line)#password cisco
lab_A(config-line)#exit

```

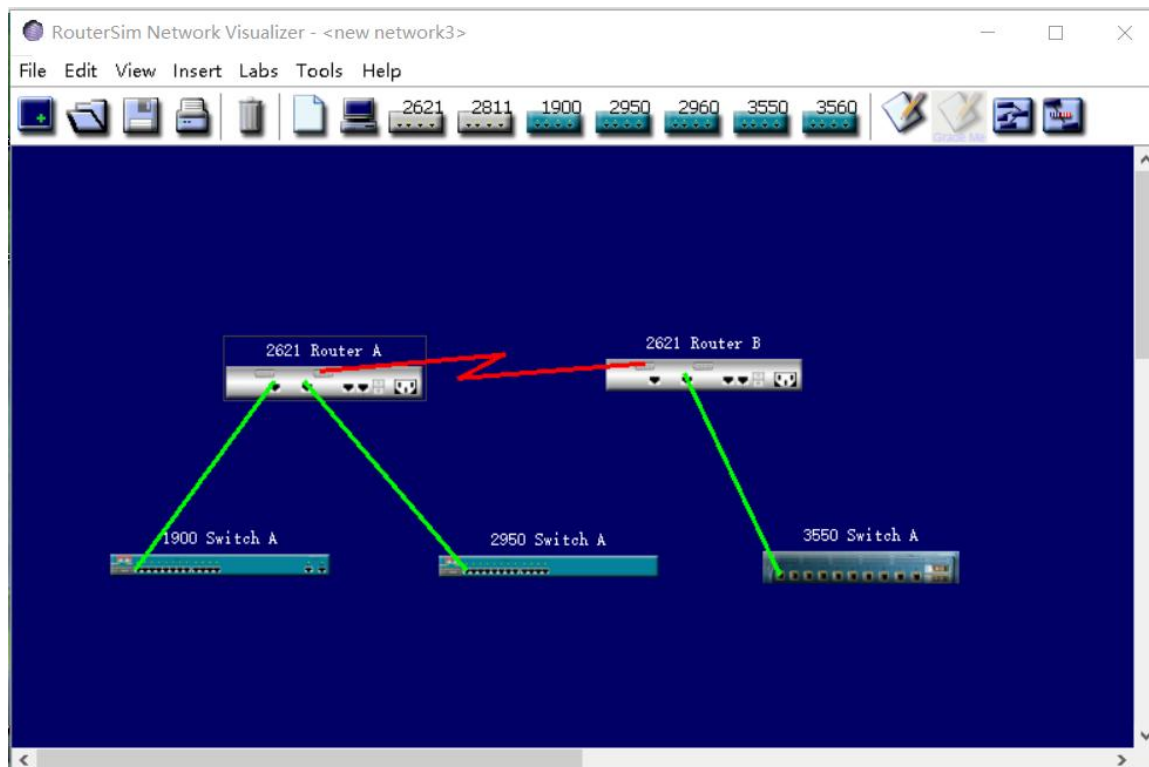
(11) 查看 DONE



## 2、使用 CCNA Network Visualizer 6.0 配置静态路由、动态路由和交换机端口的 VLAN（虚拟局域网）

### ① 配置静态路由

(1)在模拟器中放置设备，并连接（A 的 S0/0 选择 DCE）



(2) 设置路由器 A

在配置静态路由之前，要配置路由器各个端口的 IP 地址，还要用 `no shutdown` 激活端口。串口如果充当 DCE 端（数据通信设备、只有在同步通信方式的线路上才会有时钟速率），还需要配置时钟频率。

在准备工作做完后，如果查看路由表（`show ip route`）会看到路由器直连 3 个网络的情况，每个路由条目前都有一个字母 C,它所代表的含义可以通过路由条目前的 codes 得知。由“Code: C-connected,S-static,I……”可知 C 是 connected 的第一个字母，代表直连。另外在路由条目中目标网络后都有一个/24，这是网路的子网掩码，即 255.255.255.0(二进制正好是 24 个连续的 1)。路由表中还将连接网络的路由器端口表示出来，如连接网络的 201.100.11.0 的就是路由器的串行端口 Serial0。

```

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z
Router(config)#int f0/0
Router(config-if)#ip address 192.5.5.1 255.255.255.0
Router(config-if)#no shutdown
13:34:59 %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
13:34:59 %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#int f0/1
Router(config-if)#ip addr 205.7.5.1 255.255.255.0
Router(config-if)#no shutdown
13:35:20 %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
13:35:20 %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

Router(config-if)#int s0/0
Router(config-if)#ip addr 201.100.11.1 255.255.255.0
Router(config-if)#clock rate 56000
Router(config-if)#no shutdown
13:35:48 %LINK-3-UPDOWN: Interface Serial0/0, changed state to up
13:35:48 %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to up

Router(config-if)#exit
Router(config)#exit
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, * - candidate default
       U - per-user static route, o - ODR, P - periodic downloaded static route
       T - traffic engineered route

Gateway of last resort is not set
C    205.7.5.0/24 is directly connected, FastEthernet0/1
C    201.100.11.0/24 is directly connected, Serial0/0
C    192.5.5.0/24 is directly connected, FastEthernet0/0

```

### (3) 设置路由器 B

同样的方法将 RouterB 各个端口的 IP 地址配好，用命令 no shutdown 激活。注意 RouterB 的串行接口充当 DTE 端，所以不需要配置时钟频率。

```

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z
Router(config)#int f0/0
Router(config-if)#ip address 199.6.13.1 255.255.255.0
Router(config-if)#no shutdown
00:55:52 %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
00:55:52 %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#int s0/1
Router(config-if)#ip address 201.100.11.2 255.255.255.0
Router(config-if)#no shutdown
00:36:38 %LINK-3-UPDOWN: Interface Serial0/1, changed state to up
00:36:38 %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1, changed state to up

```

```
Router(config-if)#exit
Router(config)#exit
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, * - candidate default
        U - per-user static route, o - ODR, P - periodic downloaded static route
        T - traffic engineered route

Gateway of last resort is not set
C    199.6.13.0/24 is directly connected, FastEthernet0/0
C    201.100.11.0/24 is directly connected, Serial0/1
Router#
```

(4) RouterA 上用 ping 命令测试到路由器 RouterB 的直连网络地址 199.6.13.1 是否联通。Success rate is 0 percent 表示 ping 不连通，需要配置静态路由或者动态路由协议。

```
Router#ping 199.6.13.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 199.6.13.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5), round-trip min/avg/max = 0/0/0 ms
Router#
```

(5) 配置静态路由（A 到 B 的路径），检查连通性

路由器 A 如果打算向 199.6.13.0 网络转发数据包（199.6.13.0 非路由器的直连网络），它必须配置一条关于 199.6.13.0 网络的路由条目。在命令格式中，ip route 后面的 199.6.13.0 是所要到达的目的网络。255.255.255.0 是目的网络的子网掩码，而 201.100.11.2 是下一跳的 IP 地址，所谓的一下跳是指数据包向目的地址前进的下一个路由器的端口，必须保证这个端口的 IP 地址可以 ping 得通。

字母 S 表示这条路由消息是通过静态配置得到的，其次是到达网络 199.6.13.0 的下一跳地址是 201.100.11.2。



```

Router#config t
Enter configuration commands, one per line. End with CNTL/Z
Router(config)#ip route 199.6.13.0 255.255.255.0 201.100.11.2
Router(config)#exit
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, * - candidate default
       U - per-user static route, o - ODR, P - periodic downloaded static route
       T - traffic engineered route

Gateway of last resort is not set
C    205.7.5.0/24 is directly connected, FastEthernet0/1
C    201.100.11.0/24 is directly connected, Serial0/0
C    192.5.5.0/24 is directly connected, FastEthernet0/0
S    199.6.13.0 [1/0] via 201.100.11.2

```

### (7) 检查连通性

当所有路由器的路由表都配置好后，需要对连通性进行检查，通常使用 ping 命令。途中表示网络连通性良好，路由配置正确。

```

Router#ping 199.6.13.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 199.6.13.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms

```

## ② 动态路由协议 RIP 的配置

### (1) Router eSIM v1.1 上的动态路由配置

```

lab_A#config t
Enter configuration commands, one per line. End with END.
lab_A(config)#router rip
lab_A(config-router)#network 192.5.5.1
lab_A(config-router)#network 205.7.5.1
lab_A(config-router)#network 201.100.11.1

```



Checking Your Configuration

This activity is not completed.

Please click on one of the buttons below to **check** that Router's Configuration:

A

B

C

D

E

Please click on one of the buttons below to **set** that Router's Configuration:

A

B

C

D

E

Loads all router variables for this eSim™ scenario except the IP host table, which means, for example, that you will not be able to use the router name as part of ping or telnet commands.

Lab_A	Completed
Hostname	Done
Enable Secret	Done
Line Console Login	Done
Line Console Password	Done
Line vty Login	Done
Line vty Password	Done
E0 IP	Done
E0 Shutdown	Done
E1 IP	Done
E1 Shutdown	Done
S0 IP	Done
S0 Clock Rate	Done
S0 Shutdown	Done
Routing Protocol	Done
Network 1	Done
Network 2	Done
Network 3	Done
IP Host Lab_A	Done
IP Host Lab_B	Done
IP Host Lab_C	Done
IP Host Lab_D	Done
IP Host Lab_E	Done
Time elapsed	103:34

## (2) CCNA Network Visualizer 6.0 配置动态路由

### A、配置 RIP 协议并查看路由 RIP 协议的工作情况

router rip 用于启动 RIP 协议，network 用于选择 RIP 协议起作用的网络（必须是路由器直连的可分类网络。）show ip protocols 可以显示路由协议 RIP 的工作情况。可以看到路由器每隔 30 秒发布一次路由更新信息，同时路由协议 RIP 的管理距离是 120。

（ROUTER A 中）

```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z
Router(config)#router rip
Router(config-router)#network 192.5.5.0
Router(config-router)#network 205.7.5.0
Router(config-router)#network 201.100.11.0
Router(config-router)#exit
Router(config)#exit
Router#show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 11 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 any version
    Interface          Send  Recv  Triggered RIP  Key-chain
    Serial0/0           1     1 2
    FastEthernet0/1     1     1 2
    FastEthernet0/0     1     1 2
  Automatic network summarization is in effect
  Maximum path: 4
  Routing for networks:
    192.5.5.0
    201.100.11.0
    205.7.5.0
  Routing information sources:
    Gateway            Distance      Last Update
  Distance: <default is 120>
```

(ROUTER B 中)

```

Router>enable
Router#show ip protocols

Router#config t
Enter configuration commands, one per line. End with CNTL/Z
Router(config)#router rip
Router(config-router)#network 201.100.11.0
Router(config-router)#network 199.6.13.0
Router(config-router)#exit
Router(config)#exit
Router#show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 9 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 any version
    Interface          Send Recv Triggered RIP Key-chain
    Serial0/1           1     1 2
    FastEthernet0/0     1     1 2
  Automatic network summarization is in effect
  Maximum path: 4
  Routing for networks:
    201.100.11.0
    199.6.13.0
  Routing information sources:
    Gateway      Distance    Last Update
    201.100.11.1    120        00:00:21
  Distance: <default is 120>

Router#_

```

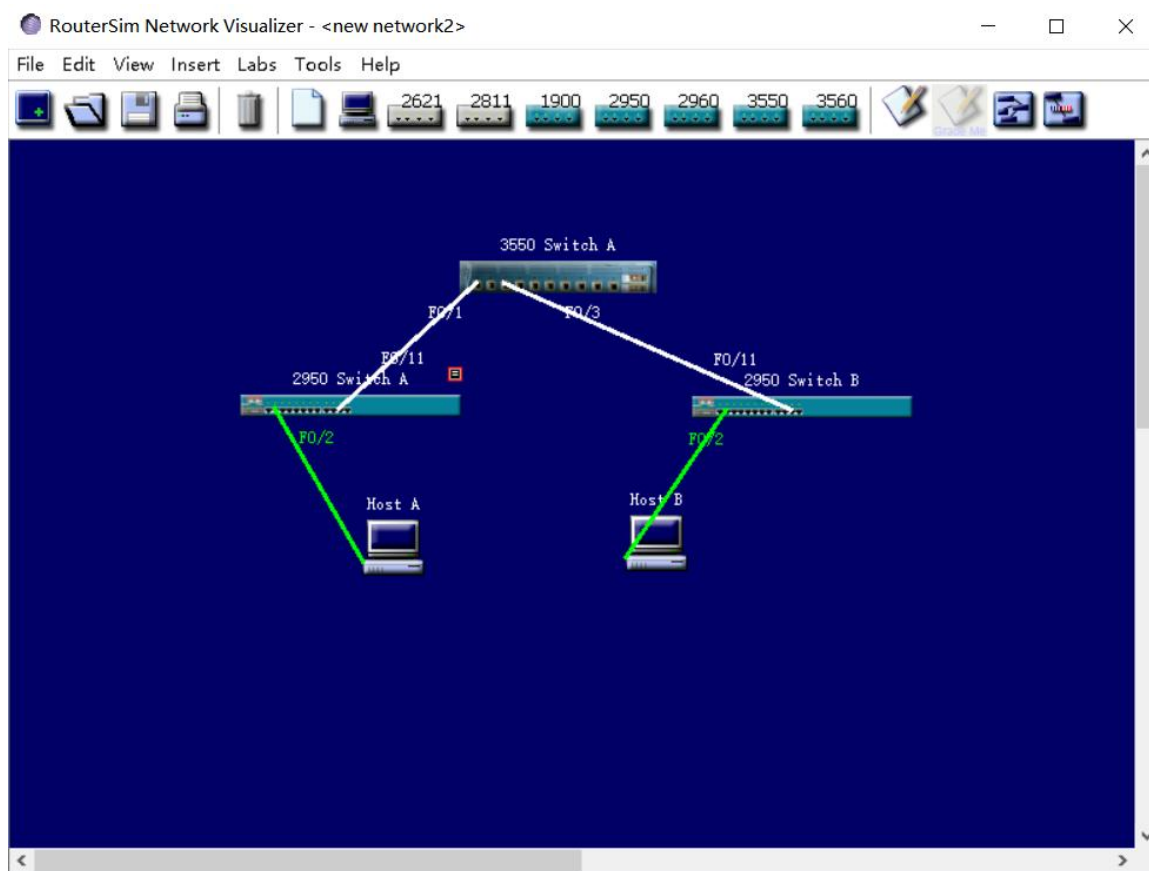
## B、查看路由表，发现其学到的网络

R 表示该条目是通过 RIP 协议学到的，到达目标网络 192.5.5.0 的数据包回从路由器的 Serial0/1 端口被转发到 IP 地址为 201.100.11.1 的下一跳路由器端口中。[120/1]表明 RIP 协议的管理距离是 120，而到达目标网络 192.5.5.0 需要经过一跳。

```
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, * - candidate default
       U - per-user static route, o - ODR, P - periodic downloaded static route
       T - traffic engineered route

Gateway of last resort is not set
R    192.5.5.0 [120/1] via 201.100.11.1, 00:00:19, Serial0/1
C    199.6.13.0/24 is directly connected, FastEthernet0/0
C    201.100.11.0/24 is directly connected, Serial0/1
R    205.7.5.0 [120/1] via 201.100.11.1, 00:00:19, Serial0/1
Router#
```

### ③ 配置交换机端口的 VLAN



#### ① 设置 VTP 域。

(1) 在 Cisco3550 交换机上将 VTP 管理域名称设为“Cisco”，并使用命令“show vtp status”检查 VTP 配置。

```

switch>en
switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z
switch(config)#hostname 3550A
3550A(config)#vtp domain Cisco
Changing VTP domain name from NULL to Cisco
3550A(config)#exit
3550A#sh vtp status
VTP Version                : 2
Configuration Revision      : 1
Maximum VLANs supported locally : 64
Number of existing VLANs    : 5
VTP Operating Mode          : Server
VTP Domain Name             : Cisco
VTP Pruning Mode            : Disabled
VTP V2 Mode                 : Disabled
VTP Traps Generation        : Disabled
MD5 digest                  : 0x70 0x01 0xF2 0x72 0x97 0xA1 0x35 0xEB
Configuration last modified by: 0.0.0.0 at 11-29-93 20:39:24
Local updater ID is 0.0.0.0 on interface V11 (lowest numbered VLAN interface found)
-----

```

(2) 在交换机 Cisco 2950A 将 VTP 管理域名称设置为 “Cisco”，并设置为客户模式。交换机 Cisco 2850B 同样。

```

switch>en
switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z
switch(config)#hostname 2950A
2950A(config)#vtp domain Cisco
Changing VTP domain name from NULL to Cisco
2950A(config)#vtp mode client
Setting device to VTP CLIENT mode.
2950A(config)#exit
2950A#sh vtp status
VTP Version                : 2
Configuration Revision      : 1
Maximum VLANs supported locally : 64
Number of existing VLANs    : 5
VTP Operating Mode          : Client
VTP Domain Name             : Cisco
VTP Pruning Mode            : Disabled
VTP V2 Mode                 : Disabled
VTP Traps Generation        : Disabled
MD5 digest                  : 0x70 0x01 0xF2 0x72 0x97 0xA1 0x35 0xEB
Configuration last modified by: 2950 SwitchB at 11-29-93 20:39:24
Local updater ID is 2950 SwitchB on interface V11 (lowest numbered VLAN interface found)
-----

```

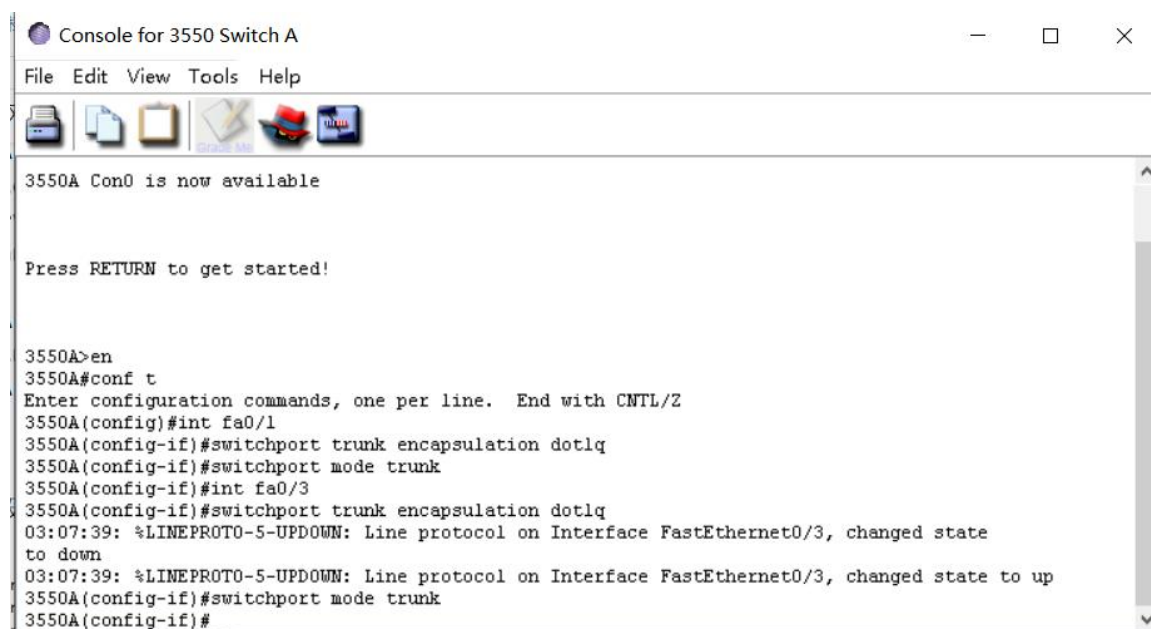
```

switch>enable
switch#config t
Enter configuration commands, one per line. End with CNTL/Z
switch(config)#hostname 2950B
2950B(config)#vtp domain Cisco
Changing VTP domain name from NULL to Cisco
2950B(config)#vtp mode client
Setting device to VTP CLIENT mode.
2950B(config)#exit
2950B#sh vtp status
VTP Version                : 2
Configuration Revision     : 1
Maximum VLANs supported locally : 64
Number of existing VLANs   : 5
VTP Operating Mode         : Client
VTP Domain Name            : Cisco
VTP Pruning Mode           : Disabled
VTP V2 Mode                : Disabled
VTP Traps Generation       : Disabled
MD5 digest                 : 0x70 0x01 0xF2 0x72 0x97 0xA1 0x35 0xEB
Configuration last modified by: 2950 SwitchB at 11-29-93 20:39:24
Local updater ID is 2950 SwitchB on interface V11 (lowest numbered VLAN interface found)
2950B#

```

### (3) 配置 Trunk

A.将交换机 3550A 端口 fa0/1 和端口 fa0/3 配置为 Trunk 端口,并用 802.1q 封装。



```

Console for 3550 Switch A
File Edit View Tools Help
3550A Con0 is now available

Press RETURN to get started!

3550A>en
3550A#conf t
Enter configuration commands, one per line. End with CNTL/Z
3550A(config)#int fa0/1
3550A(config-if)#switchport trunk encapsulation dot1q
3550A(config-if)#switchport mode trunk
3550A(config-if)#int fa0/3
3550A(config-if)#switchport trunk encapsulation dot1q
03:07:39: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to down
03:07:39: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to up
3550A(config-if)#switchport mode trunk
3550A(config-if)#

```

B.分别将交换机 2950A 和 2950B 的端口 fa0/11 设置为 Trunk 端口

```

2950A>en
2950A#conf t
Enter configuration commands, one per line. End with CNTL/Z
2950A(config)#interface fa0/11
2950A(config-if)#switchport mode trunk
2950A(config-if)#_

```

```

2950B>en
2950B#config t
Enter configuration commands, one per line. End with CNTL/Z
2950B(config)#interface fa0/11
2950B(config-if)#switchport mode trunk
2950B(config-if)#_

```

#### (4) 创建 VLAN

创建两个 VLAN：VLAN10 和 VLAN20，并用 show vlan 命令验证。

```

3550A>en
3550A#conf t
Enter configuration commands, one per line. End with CNTL/Z
3550A(config)#vlan 10

```

```

3550A(config-vlan)#vlan 20
3550A(config-vlan)#exit
3550A(config)#exit
3550A#sh vlan

```

VLAN	Name	Status	Ports
1	default	active	Fa0/2, Fa0/4, Fa0/5, Fa0/6 Fa0/7, Fa0/8, Fa0/9, Fa0/10
10	VLAN0010	active	
20	VLAN0020	active	
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

#### (5) 分配交换机端口加入 VLAN

分别将交换机 2950A 和 2950B 的端口 fa0/2 加入 vlan10 和 vlan20。



```

2950A>en
2950A#conf t
Enter configuration commands, one per line. End with CNTL/Z
2950A(config)#interface fa0/2
2950A(config-if)#switchport access vlan 10
2950A(config-if)#

```

```

2950B(config)#interface fa0/2
2950B(config-if)#switchport access vlan 20
2950B(config-if)#

```

#### (6) 配置第三层交换机

A、在 3550 交换机上分别设置各 VLAN 的接口 IP 地址，3505 交换机将 VLAN 作为一种接口对待，就像路由器一样，提供 VLAN10 和 VLAN20 之间的路由。

```

3550A#config t
Enter configuration commands, one per line. End with CNTL/Z
3550A(config)#int vlan 10
3550A(config-if)#ip address 10.10.10.1 255.255.255.0
3550A(config-if)#no shut
3550A(config-if)#int vlan 20
3550A(config-if)#ip address 20.20.20.1 255.255.255.0
3550A(config-if)#no shut
3550A(config-if)#exit

```

#### B、启用路由

```

3550A(config)#ip routing

```

#### (7) 配置各交换机的管理地址

```

3550A(config)#int vlan 1
3550A(config-if)#ip address 192.169.10.1 255.255.255.0
3550A(config-if)#no shut

```

```

2950A(config)#int vlan 1
2950A(config-if)#ip address 192.168.10.2 255.255.255.0
2950A(config-if)#no shutdown

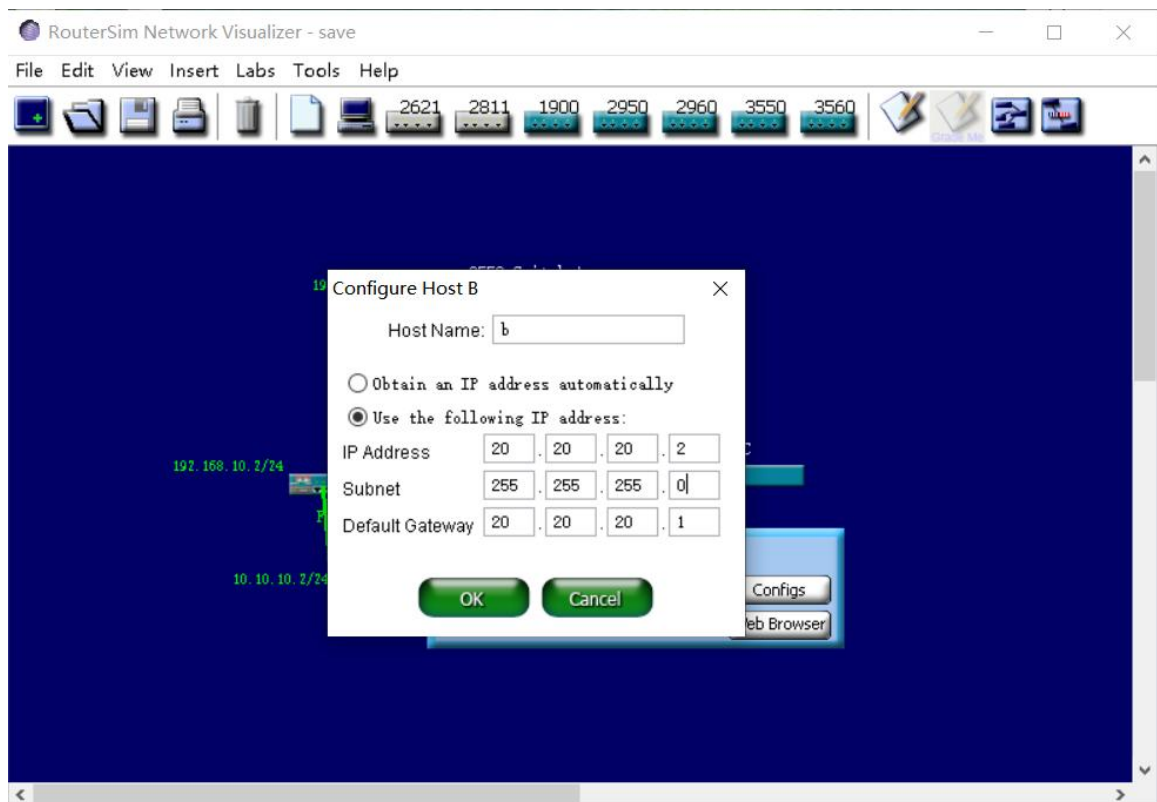
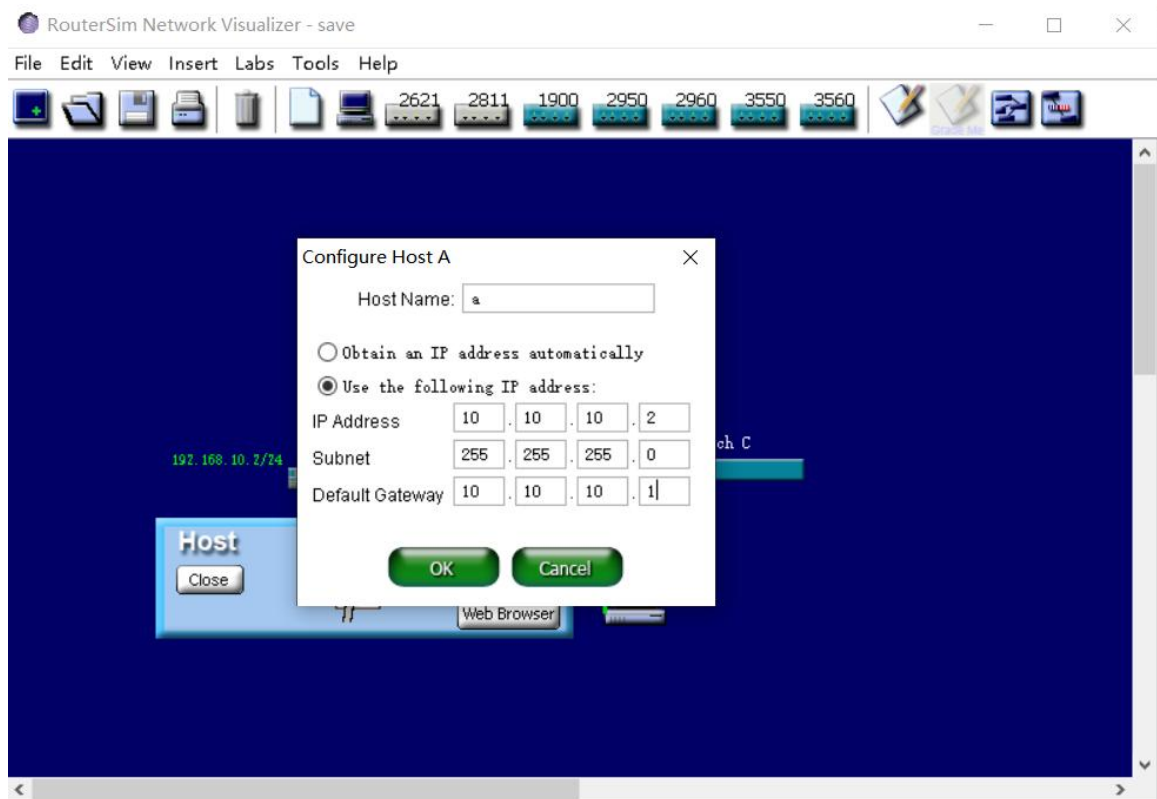
```

```

2950B(config)#int vlan 1
2950B(config-if)#ip address 192.168.10.3 255.255.255.0
2950B(config-if)#no shutdown

```

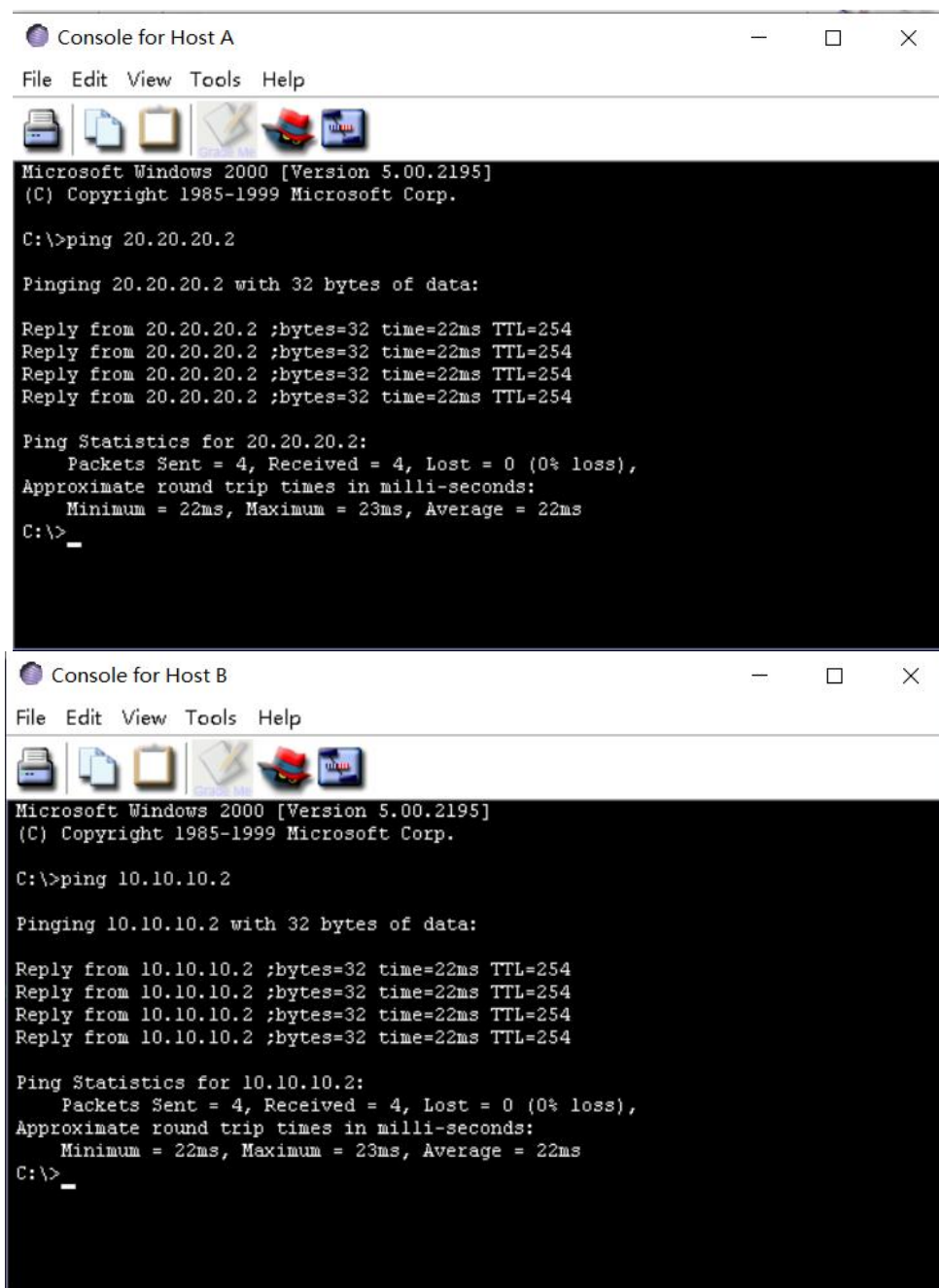
(8) 配置主机 HostA 和 HostB，并进行测试，在 3550 交换机上分别 ping2950A、B 交换机。



```
3550A>en
3550A#ping 192.168.10.2

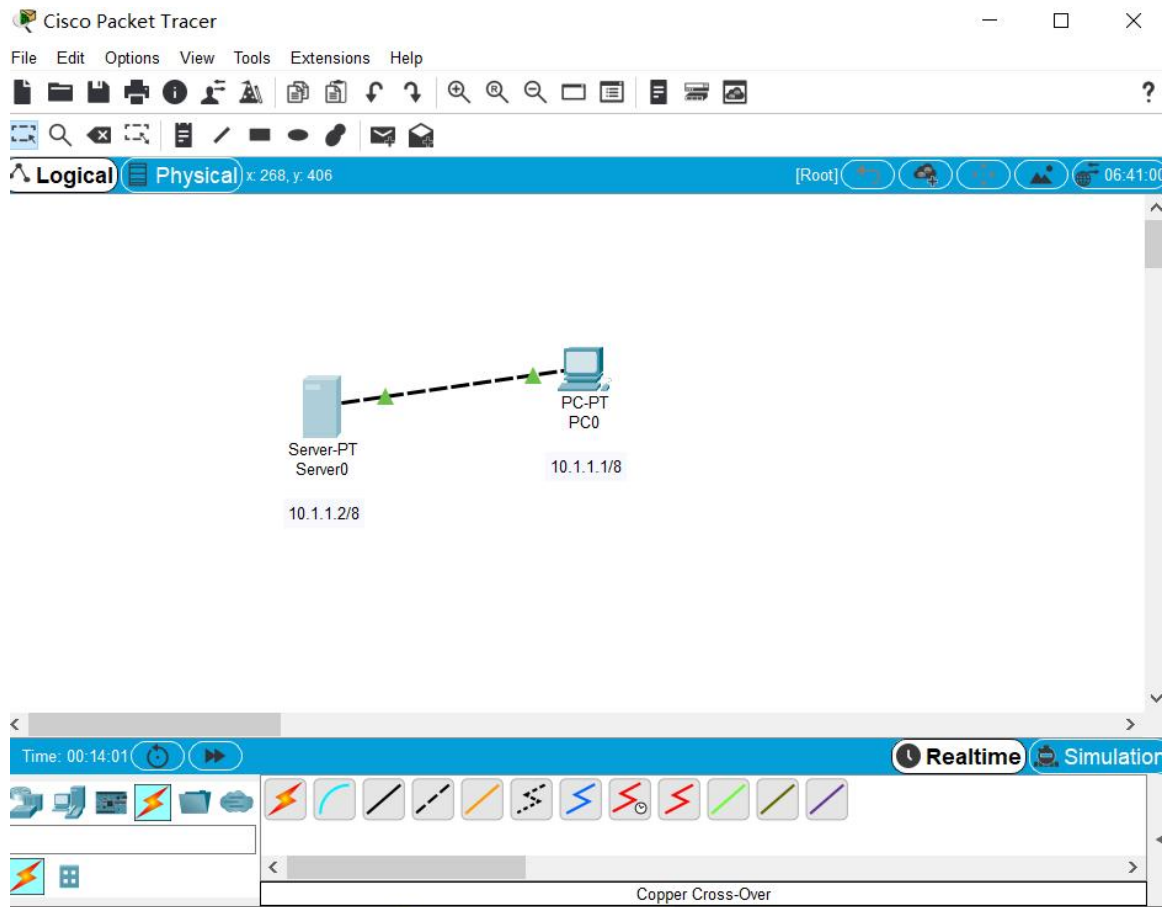
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.10.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms
3550A#ping 192.168.10.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.10.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms
```

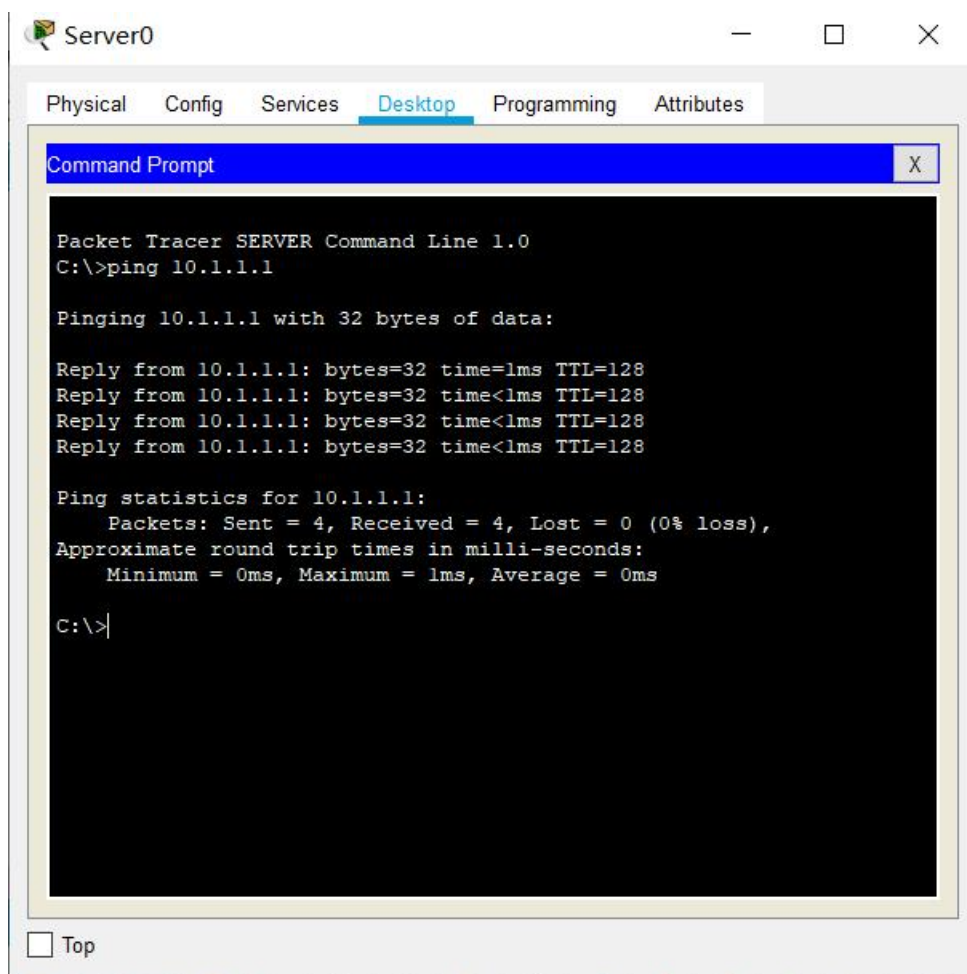


### 3、思科模拟器 Packet Tracer 7.0 配置静态路由

#### (1) 终端与服务器的使用 (HTTP、DNS)



Ping 通。



图是在 DNS 服务器中将域名 `www.icebear.com` 转换为服务器 IP (10.1.1.2)，并且限制了 `http` 功能仅开启了 `https` 功能，故只能通过 `https://www.icebear.com` 进行访问。注意这里的 PC0 也应该设置 DNS Server。设置成服务器的地址。

PC0

Physical **Config** Desktop Programming Attributes

**GLOBAL**

Settings

Algorithm Settings

**INTERFACE**

FastEthernet0

Bluetooth

Global Settings

Display Name PC0

Interfaces FastEthernet0

Gateway/DNS IPv4

☐ DHCP

☒ Static

Gateway

DNS Server 10.1.1.2

Gateway/DNS IPv6

☐ DHCP

☐ Auto Config

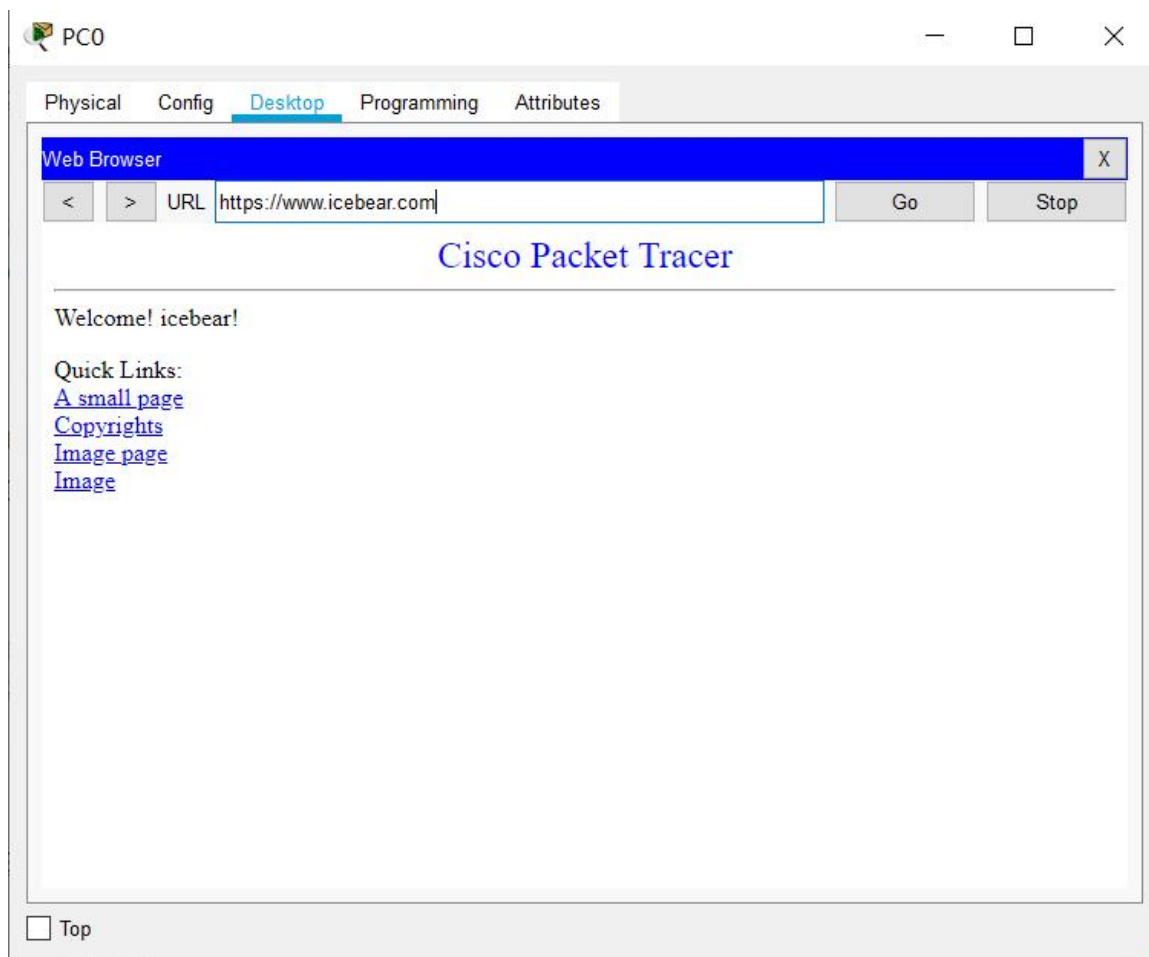
☒ Static

IPv6 Gateway

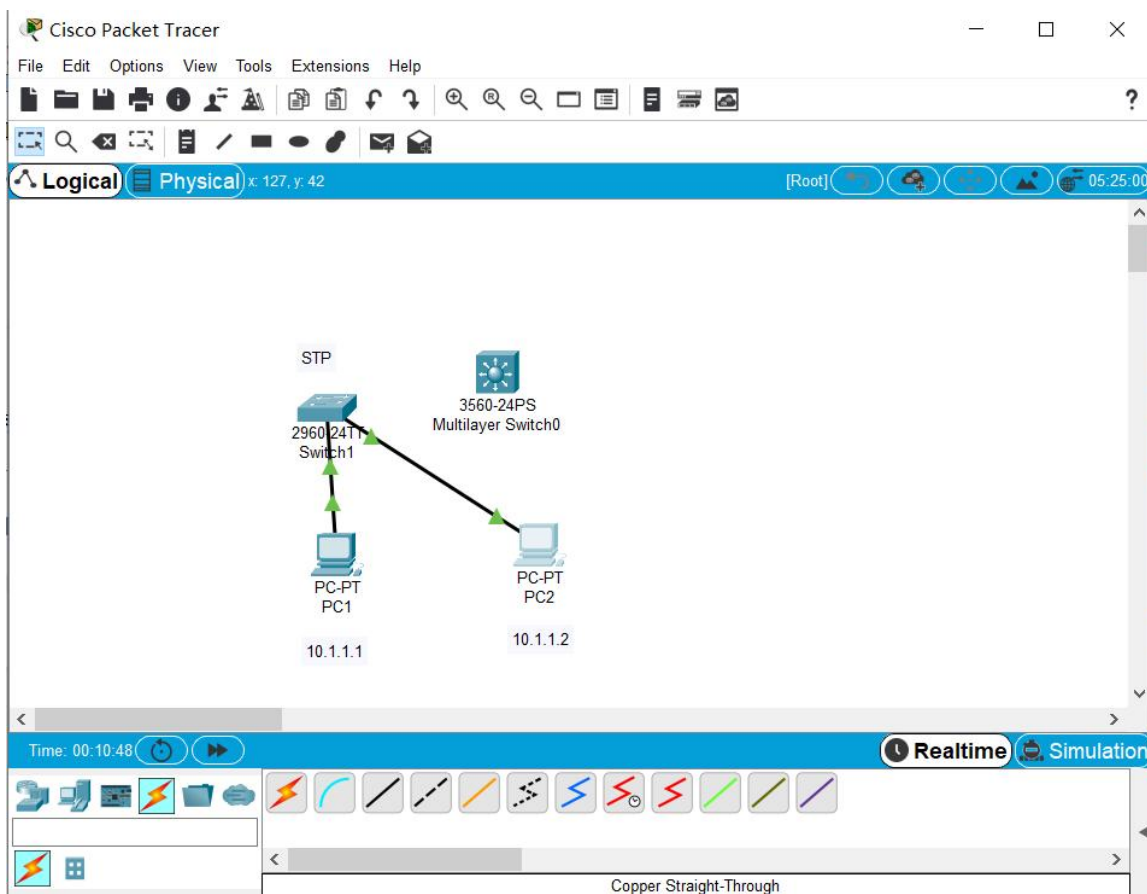
IPv6 DNS Server

☐ Top





## (2) 交换机的使用



```
Switch(config-if)#ip address 10.1.1.3 255.0.0.0
Switch(config-if)#no shutdown
```

```
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed
state to up
```

```
Switch(config-if)#end
Switch#
%SYS-5-CONFIG_I: Configured from console by console
```

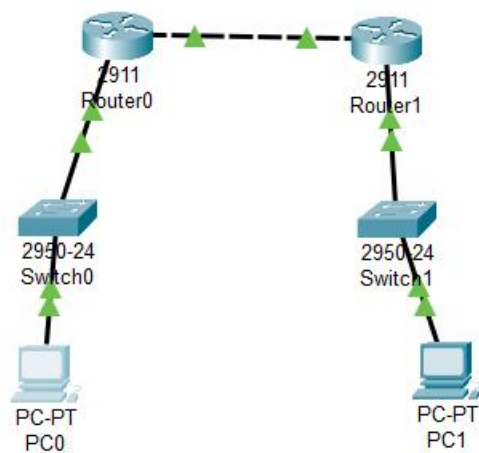
```
Switch#ping 10.1.1.1
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/1/4
ms
```

```
Switch#ping 10.1.1.2
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.2, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0
ms
```

### (3)静态路由配置



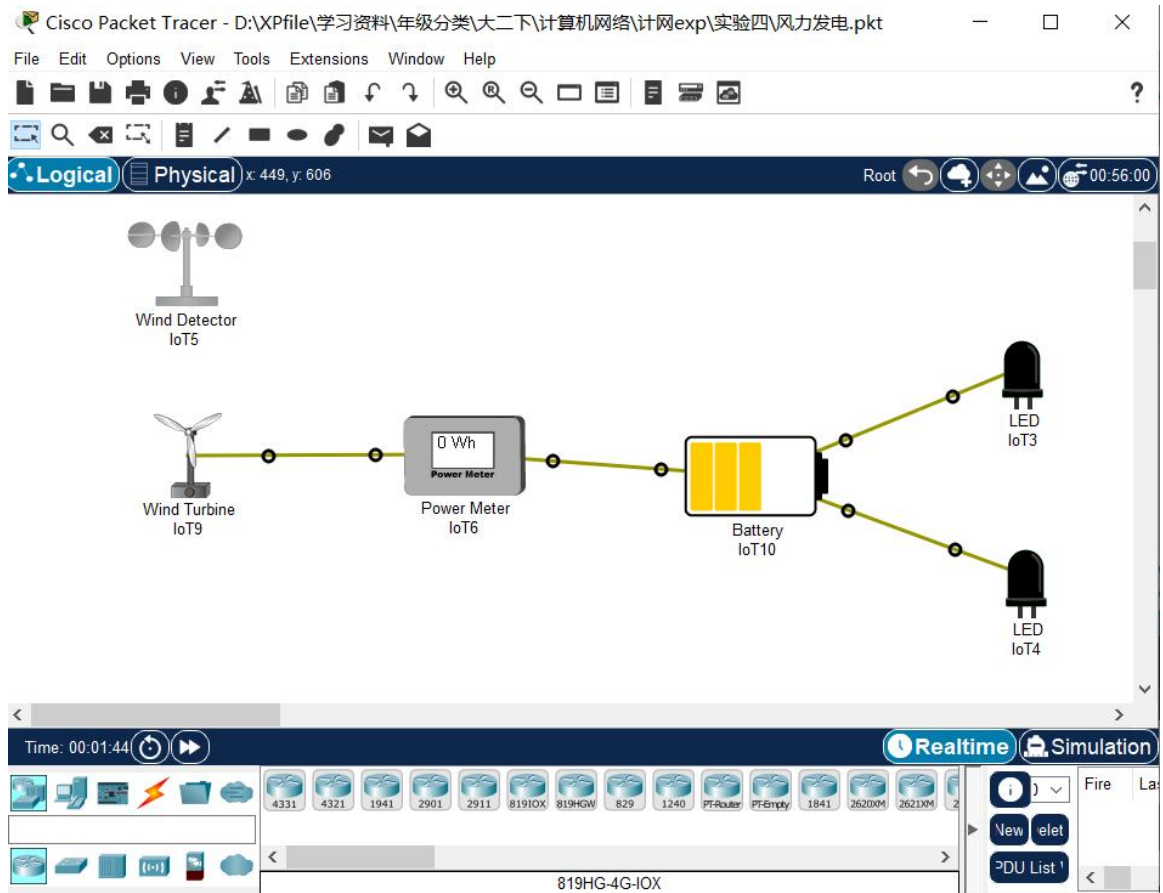
```
C:\>ping 172.16.1.1

Pinging 172.16.1.1 with 32 bytes of data:

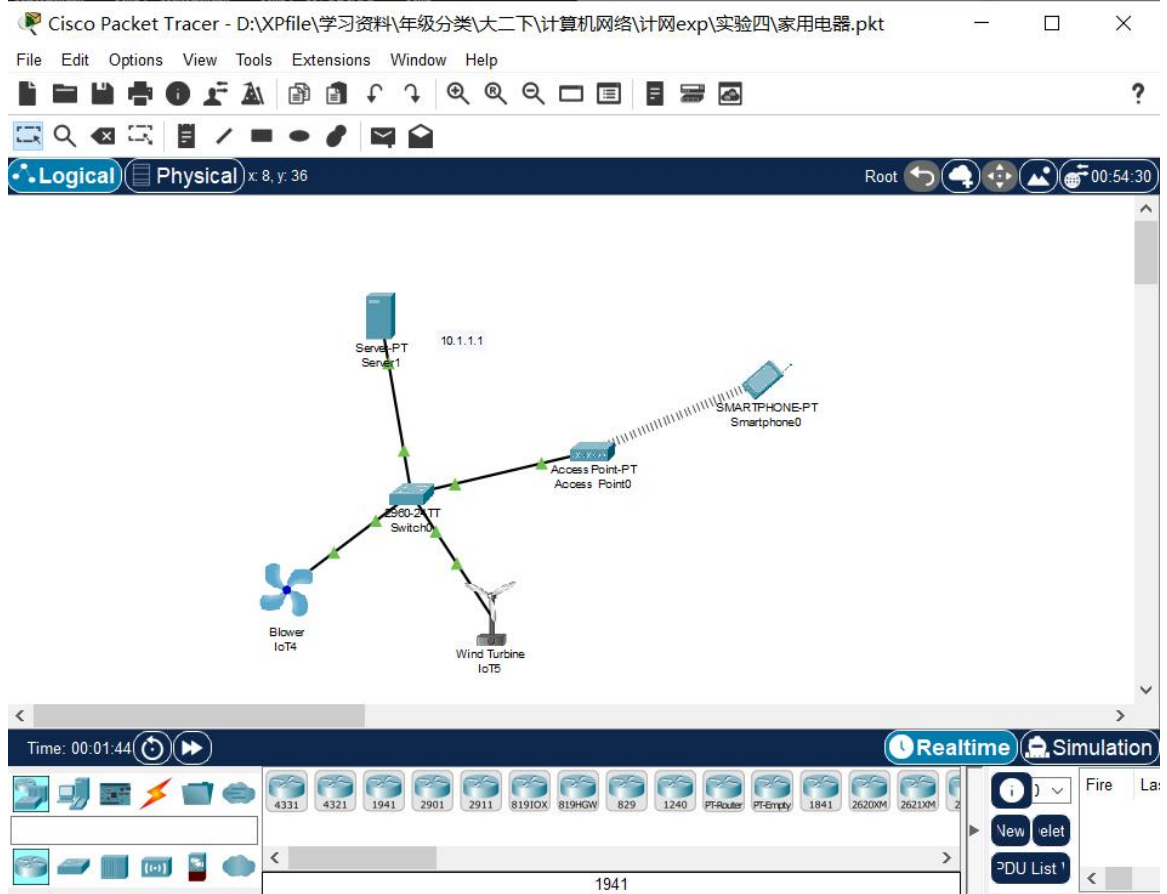
Reply from 172.16.1.1: bytes=32 time<1ms TTL=126
Reply from 172.16.1.1: bytes=32 time<1ms TTL=126
Reply from 172.16.1.1: bytes=32 time<1ms TTL=126
Reply from 172.16.1.1: bytes=32 time<1ms TTL=126

Ping statistics for 172.16.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

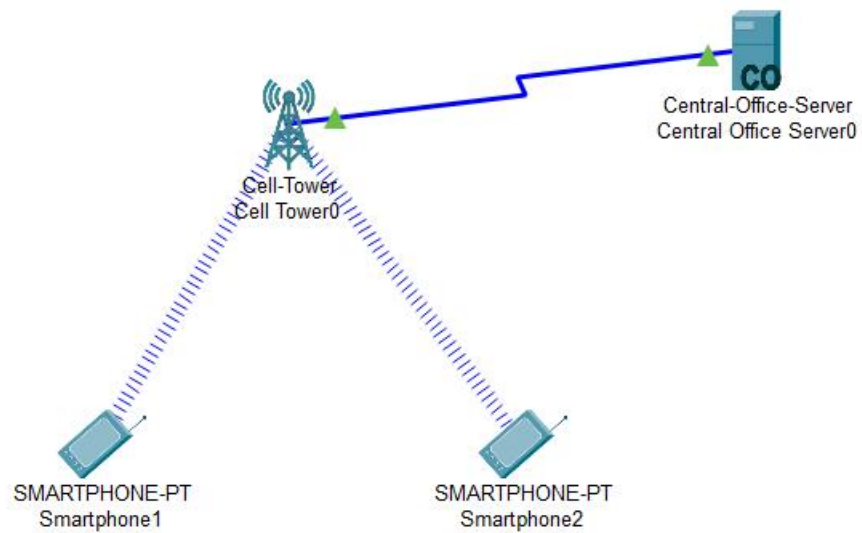
### (4) 风力发电



## 5、家用电器



## 6、3G4G



## 4 实验代码

本次实验的代码已上传于以下代码仓库：

[https://github.com/ryanregal/Exp\\_ComputerNetwork](https://github.com/ryanregal/Exp_ComputerNetwork)

## 5 实验总结

通过这次实验，我更加熟悉静态路由、动态路由协议 RIP 以及虚拟广域网。学习了用 Router eSIM v1.1 模拟器来模拟路由器的配置环境；使用 CCNA Network Visualizer 6.0 配置静态路由、动态路由和交换机端口的 VLAN（虚拟局域网）。