厦門大學

信息学院软件工程系

《计算机网络》实验报告

题 目 ___实验五 CISCO IOS 路由器基本配置___

班 级 ___软件工程 2018 级 1 班___

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实验时间 ___2020 年 4 月 19 日___

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1 实验目的

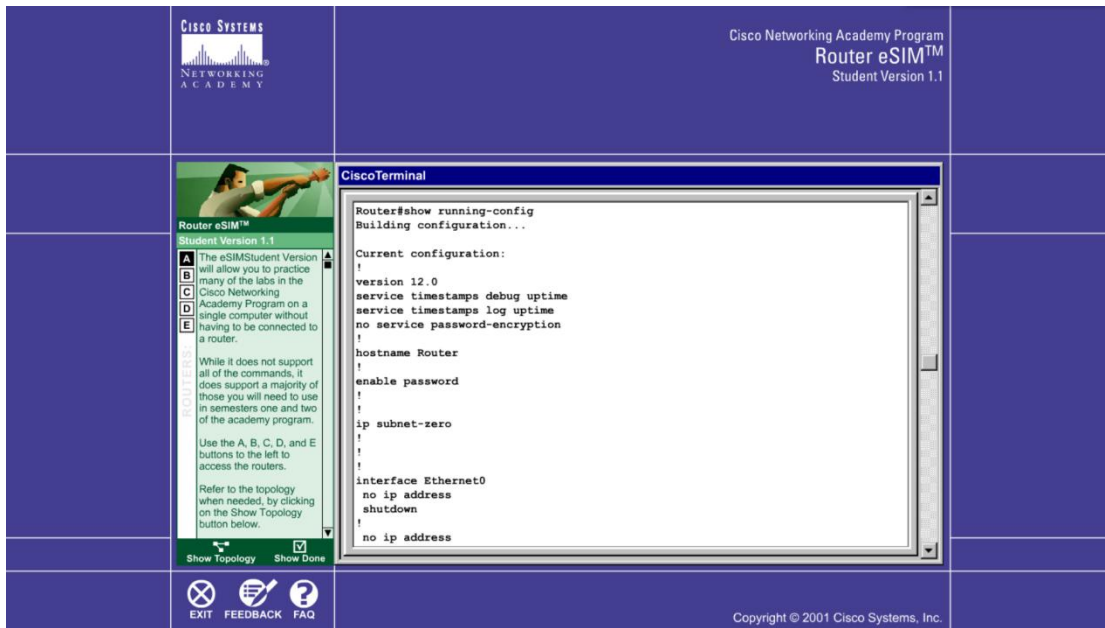# 2 使用 Router eSIM v1.1 模拟器来模拟路由器的配置环境；使用 CCNA Network，Visualizer 6.0 配置静态路由、动态路由和交换机端口的 VLAN（虚拟局域网）。

3 实验环境

Windows 系统，Router eSIM v1.1，CCNA Network，
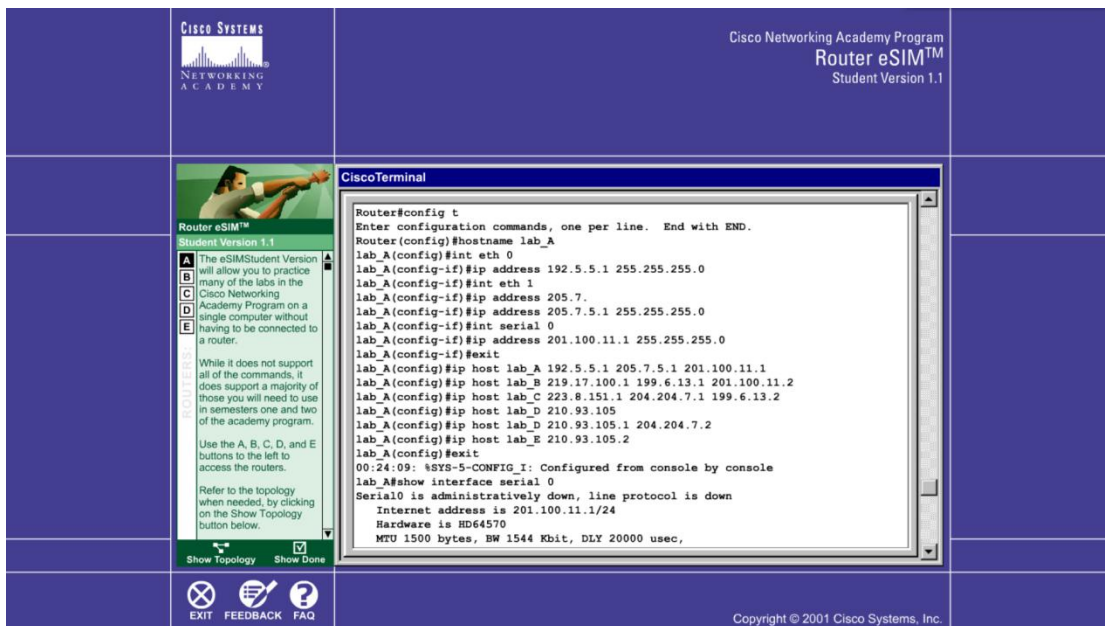
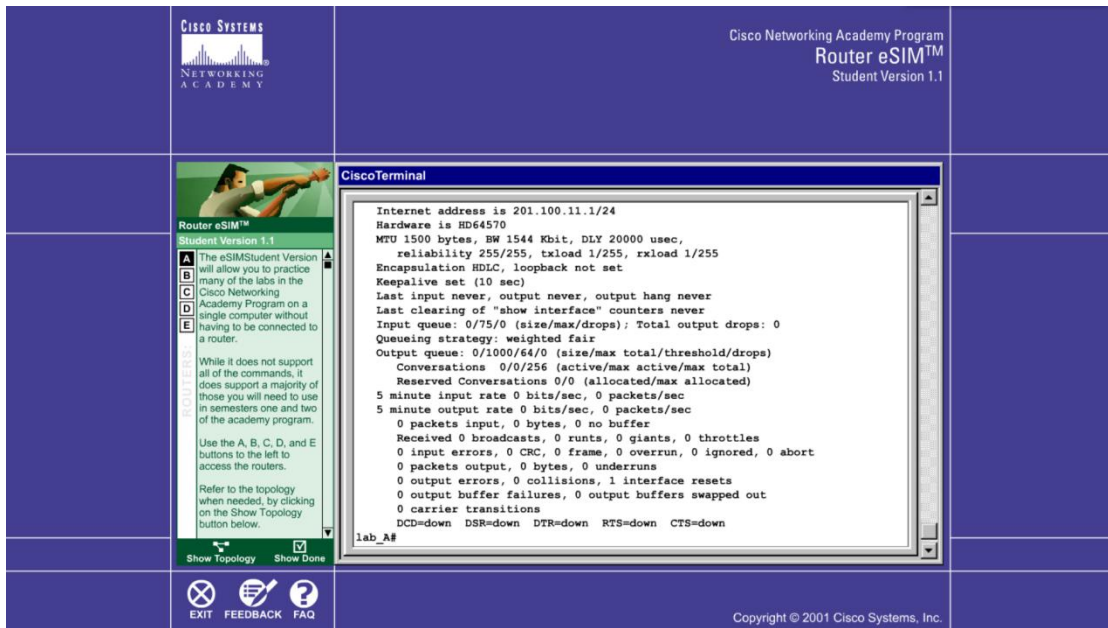Visualizer 6.0，Cisco Packet Tracer
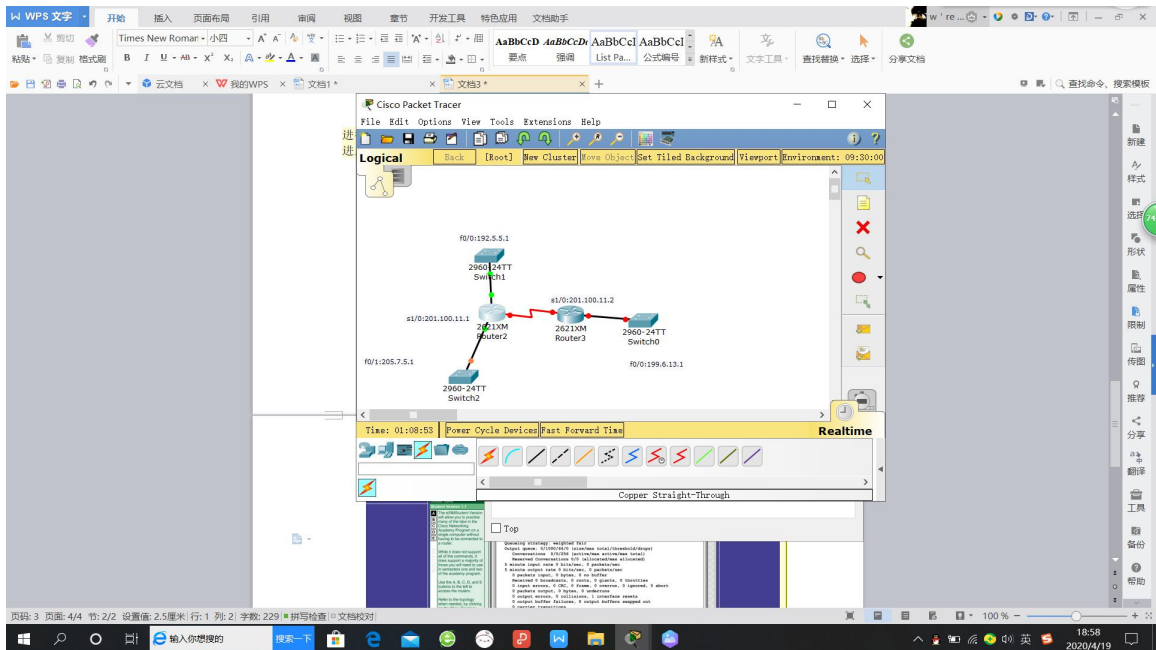
4 实验结果

测试功能，以及一些查询功能的使用

进行路由器的配置：

进入全局使用模式并设置 ip 地址

CCNA Network Visualizer 6.0 的证书按网上方法无法使用，故换 Cisco Packet

Tracer

```
Router>enable
Router#confi ter
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

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0,
changed state to up

Router(config-if)#int s1/0
Router(config-if)#ip addr 201.100.11.1 255.255.255.0
Router(config-if)#clock rate 56000
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial1/0, changed state to down
Router(config-if)#int f0/1
Router(config-if)#ip addr 205.7.5.1 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1,
changed state to up

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

路由器 A 的路由表：

```
%LINK-5-CHANGED: Interface Serial1/0, changed state to down
Router(config-if)#int f0/1
Router(config-if)#ip addr 205.7.5.1 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#write
Building configuration...
[OK]
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

C    192.5.5.0/24 is directly connected, FastEthernet0/0
C    205.7.5.0/24 is directly connected, FastEthernet0/1

Router#
```

路由器 B 的路由表：

```
%LINK-5-CHANGED: Interface Serial1/0, changed state to up

Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0, changed
state to up

Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#write
Building configuration...
[OK]
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

C    199.6.13.0/24 is directly connected, FastEthernet0/0
C    201.100.11.0/24 is directly connected, Serial1/0

Router#
```

通过 ping 命令查看是否连通：

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0, changed
state to up

Router>enable
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

C    192.5.5.0/24 is directly connected, FastEthernet0/0
C    201.100.11.0/24 is directly connected, Serial1/0
C    205.7.5.0/24 is directly connected, FastEthernet0/1

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)

Router#
```

查看 ip route 表：

```
Router>enable
Router#config ter
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#
%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

C    192.5.5.0/24 is directly connected, FastEthernet0/0
S    199.6.13.0/24 [1/0] via 201.100.11.2
C    201.100.11.0/24 is directly connected, Serial1/0
C    205.7.5.0/24 is directly connected, FastEthernet0/1

Router#
```

配置 A 路由的静态路由：

```
Router>enable
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#
%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

C    192.5.5.0/24 is directly connected, FastEthernet0/0
S    199.6.13.0/24 [1/0] via 201.100.11.2
C    201.100.11.0/24 is directly connected, Serial1/0
C    205.7.5.0/24 is directly connected, FastEthernet0/1

Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
```

配置 B 路由的静态路由：

```
Router>enable
Router#config ter
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 192.5.5.0 255.255.255.0 201.100.11.1
Router(config)#ip route 205.7.5.0 255.255.255.0 201.100.11.1
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

S    192.5.5.0/24 [1/0] via 201.100.11.1
C    199.6.13.0/24 is directly connected, FastEthernet0/0
C    201.100.11.0/24 is directly connected, Serial1/0
S    205.7.5.0/24 [1/0] via 201.100.11.1

Router#
```

A，B 尝试连线并成功设置：

```
Router con0 is now available




Press RETURN to get started.
```

```
Router>enable
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 = 3/3/5 ms

Router#
```

```
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

S    192.5.5.0/24 [1/0] via 201.100.11.1
C    199.6.13.0/24 is directly connected, FastEthernet0/0
C    201.100.11.0/24 is directly connected, Serial1/0
S    205.7.5.0/24 [1/0] via 201.100.11.1

Router#ping 192.5.5.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.5.5.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/2/4 ms

Router#
```
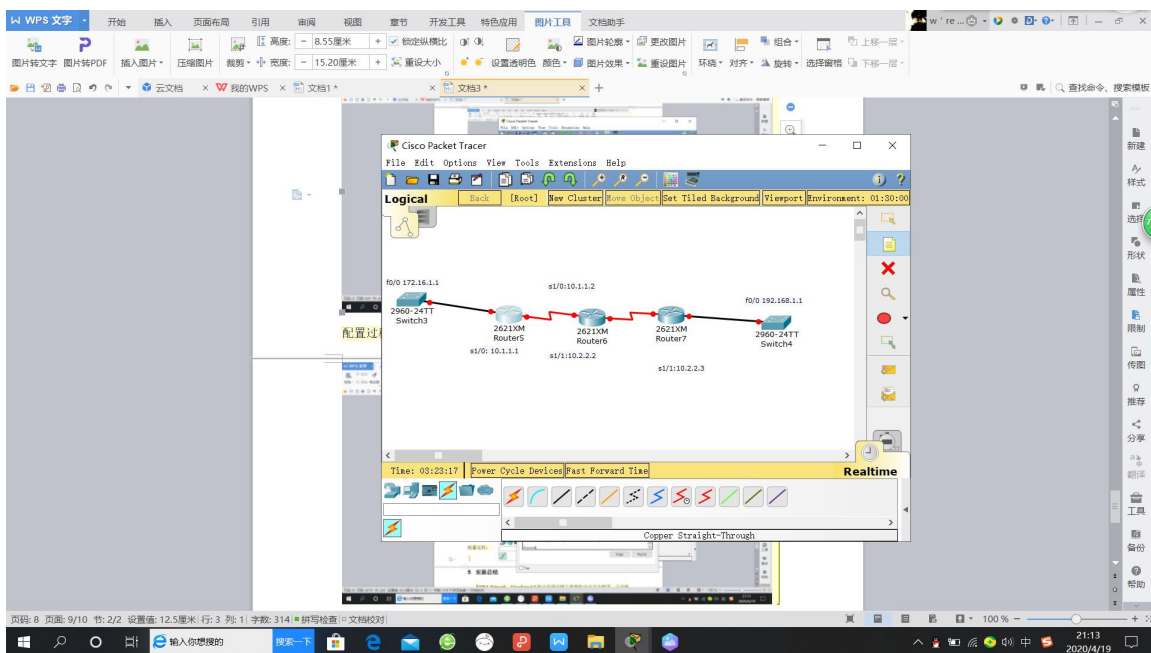
配置动态路由，拓扑图：

配置过程：

```
bytes of memory
.
Processor board ID JAD05190MTZ (4292891495)
M860 processor: part number 0, mask 49
Bridging software.
X.25 software, Version 3.0.0.
2 FastEthernet/IEEE 802.3 interface(s)
8 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)


        --- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: no


Press RETURN to get started!



Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 172.16.0.0
Router(config-router)#network 10.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
```

```
X.25 software, Version 3.0.0.
2 FastEthernet/IEEE 802.3 interface(s)
8 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)


        --- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: no


Press RETURN to get started!



Router>enable
Router#config ter
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#write
Building configuration...
[OK]
Router#exit
```

```
2 FastEthernet/IEEE 802.3 interface(s)
8 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)


        --- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: no


Press RETURN to get started!



Router>enable
Router#config ter
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 192.168.1.0
Router(config-router)#network 10.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#write
Building configuration...
[OK]
Router#exit
```
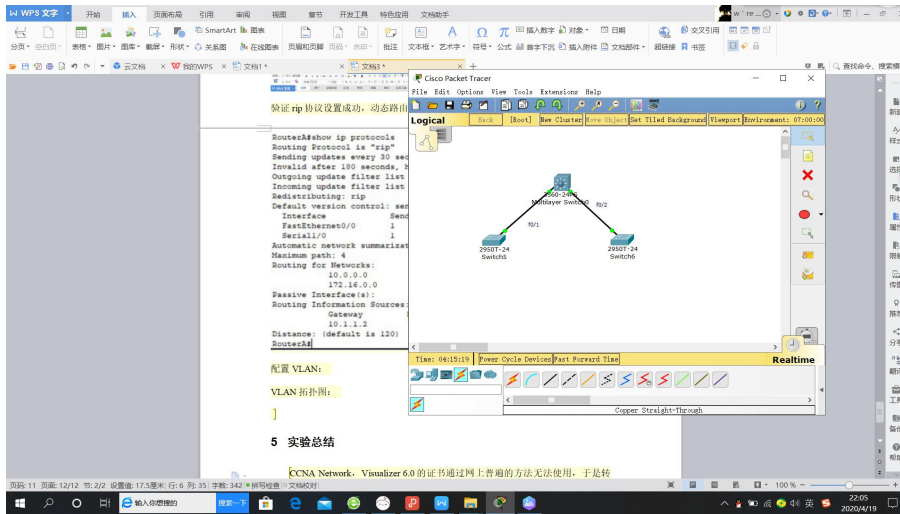
验证 rip 协议设置成功，动态路由配置完成：

```
RouterA#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 8 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
  FastEthernet0/0       1     2 1
  Serial1/0             1     2 1
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
          10.0.0.0
          172.16.0.0
Passive Interface(s):
Routing Information Sources:
        Gateway          Distance      Last Update
        10.1.1.2           120         00:00:03
Distance: (default is 120)
RouterA#
```

配置 VLAN：

VLAN 拓扑图：

设置交换机，创建 VLAN，验证是否连接成功

```
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       Set the device to client mode.
  server       Set the device to server mode.
  transparent  Set the device to transparent mode.
2950A(config)#vtp mode client
Setting device to VTP CLIENT mode.
2950A(config)#exit
2950A#
%SYS-5-CONFIG_I: Configured from console by console

2950A#sh vtp status
VTP Version                     : 2
Configuration Revision          : 0
Maximum VLANs supported locally : 255
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                      : 0xA9 0xC8 0x52 0x12 0x94 0x71
0xE9 0x8C
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
2950A#
```

```
Switch>en
Switch#conf 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
```

```
3550A#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
3550A(config)#int f0/1
3550A(config-if)#switchport trunk encapsulation ?
  dot1q  Interface uses only 802.1q trunking encapsulation when trunking
```

```
3550A(config-if)#switchport mode trunk
Command rejected: An interface whose trunk encapsulation is "Auto" can not be
configured to "trunk" mode.
3550A(config-if)#switchport trunk encapsulation dot
3550A(config-if)#switchport mode trunk

3550A(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

3550A(config-if)#switchport trunk encapsulation dot
3550A(config-if)#switchport mode trunk
```

```
3550A(config-if)#switchport trunk encapsulation dot
3550A(config-if)#switchport mode trunk
3550A(config-if)#int f0/2
3550A(config-if)#switchport trunk encapsulation dot
3550A(config-if)#switchport mode trunk

3550A(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2,
changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2,
changed state to up
```

```
2950A(config)#int f0/1
2950A(config-if)#switchport mode trunk
2950A(config-if)#exit
2950A(config)#
```

创建 VLAN

```
3550A(config)#exit
3550A#
%SYS-5-CONFIG_I: Configured from console by console

3550A#sh vlan

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/3, Fa0/4, Fa0/5, Fa0/6
                                                Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                                Fa0/11, Fa0/12, Fa0/13, Fa0/14
                                                Fa0/15, Fa0/16, Fa0/17, Fa0/18
                                                Fa0/19, Fa0/20, Fa0/21, Fa0/22
                                                Fa0/23, Fa0/24, Gig0/1, Gig0/2
10   VLAN0010                         active
20   VLAN0020                         active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------
1    enet  100001     1500  -      -      -        -    -        0      0
10   enet  100010     1500  -      -      -        -    -        0      0
20   enet  100020     1500  -      -      -        -    -        0      0
1002 fddi  101002     1500  -      -      -        -    -        0      0
1003 tr    101003     1500  -      -      -        -    -        0      0
1004 fdnet 101004     1500  -      -      -        ieee -        0      0
1005 trnet 101005     1500  -      -      -        ibm  -        0      0

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------

Remote SPAN VLANs
------------------------------------------------------------------------------

Primary Secondary Type              Ports
------- --------- ----------------- ------------------------------------------
3550A#


Enter configuration commands, one per line.  End with CNTL/Z.
2950A(config)#int f0/1
2950A(config-if)#switchport mode trunk
2950A(config-if)#exit
2950A(config)#int f0/2
2950A(config-if)#switchport access vlan 10
2950A(config-if)#exit
2950A(config)#int f0/2
2950A(config-if)#switchport mode trunk

2950A(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2,
changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2,
changed state to up


2950B(config)#int f0/2
2950B(config-if)#switchport mode trunk

2950B(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2,
changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2,
changed state to up

2950B(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1,
changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1,
changed state to up

2950B(config-if)#switchport access vlan 20
2950B(config-if)#exit
2950B(config)#

3550A(config-if)#int vlan 1
3550A(config-if)#ip addr 192.168.10.1 255.255.255.0
3550A(config-if)#no shut
3550A(config-if)#
```

```
2950A>en
2950A#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
2950A(config)#int vlan 1
2950A(config-if)#ip addr 192.168.10.2 255.255.255.0

2950A(config-if)#no shutdown

2950A(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

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


2950B>en
2950B#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
2950B(config)#int vlan 1
2950B(config-if)#ip addr 192.168.10.3 255.255.255.0
2950B(config-if)#no shutdown

2950B(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

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

2950B(config-if)#
```

用 ping 指令测试，显示成功连接

```
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 = 0/0/3
ms

3550A#192.168.10.3
Trying 192.168.10.3 ...Open

[Connection to 192.168.10.3 closed by foreign host]
```

5   实验总结

CCNA Network，Visualizer 6.0 的证书通过网上普遍的方法无法使用，于是转用功能差不多的 Cisco Packet Tracer