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 2 班

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实验时间 2020 年 4 月 8 日

2020 年 4 月 21 日

1 实验目的

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）。

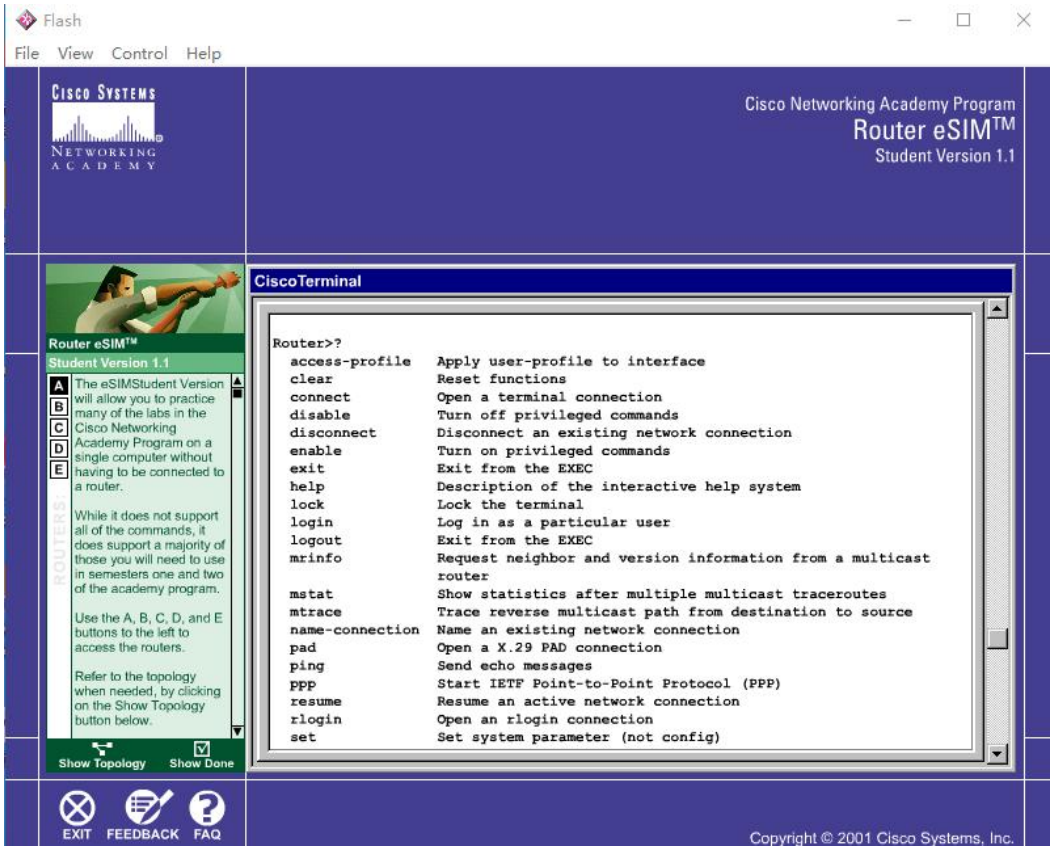
2 实验环境

操作环境：Router eSIM v1.1 模拟器、CCNA Network Visualizer 6.0

3 实验结果

1、Cisco IOS 的基本操作和路由器的常规配置：

（1）以普通用户身份查看路由器状态，截图如下：



（2）路由器配置模式切换，截图如下：

```
Router>
Router>
Router>enable
Router#
Router# disable
Router>enable
Router#
```

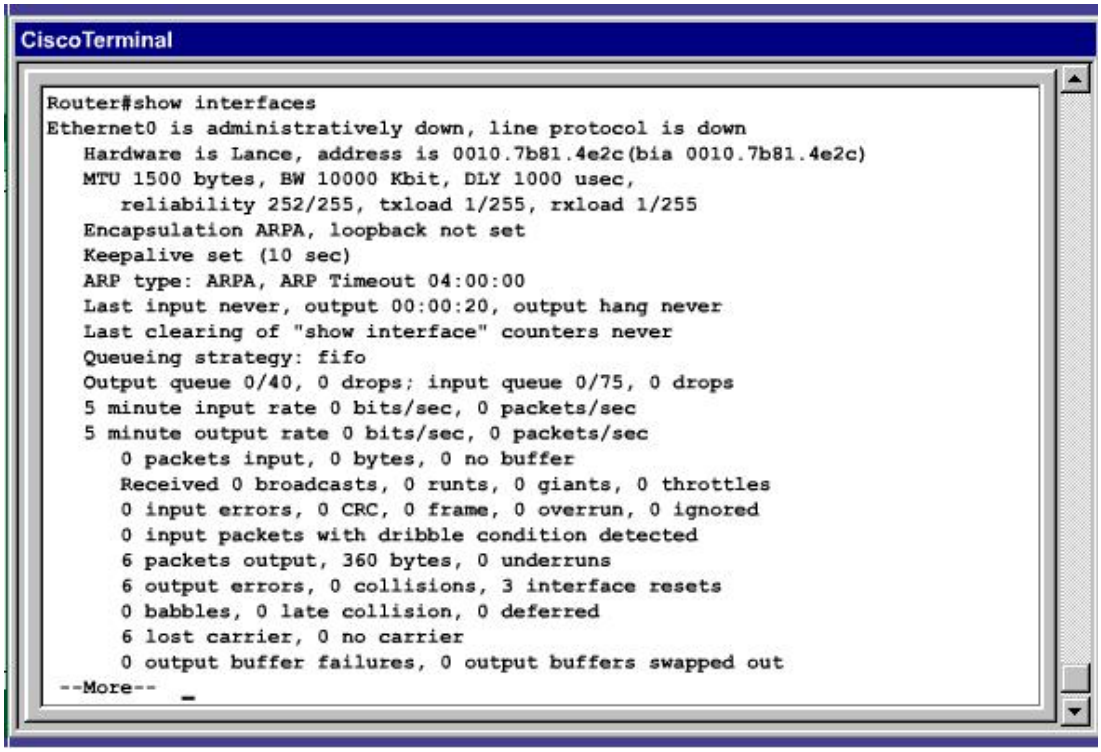
（2）查看路由器运行状态，截图如下：

1.show running-config

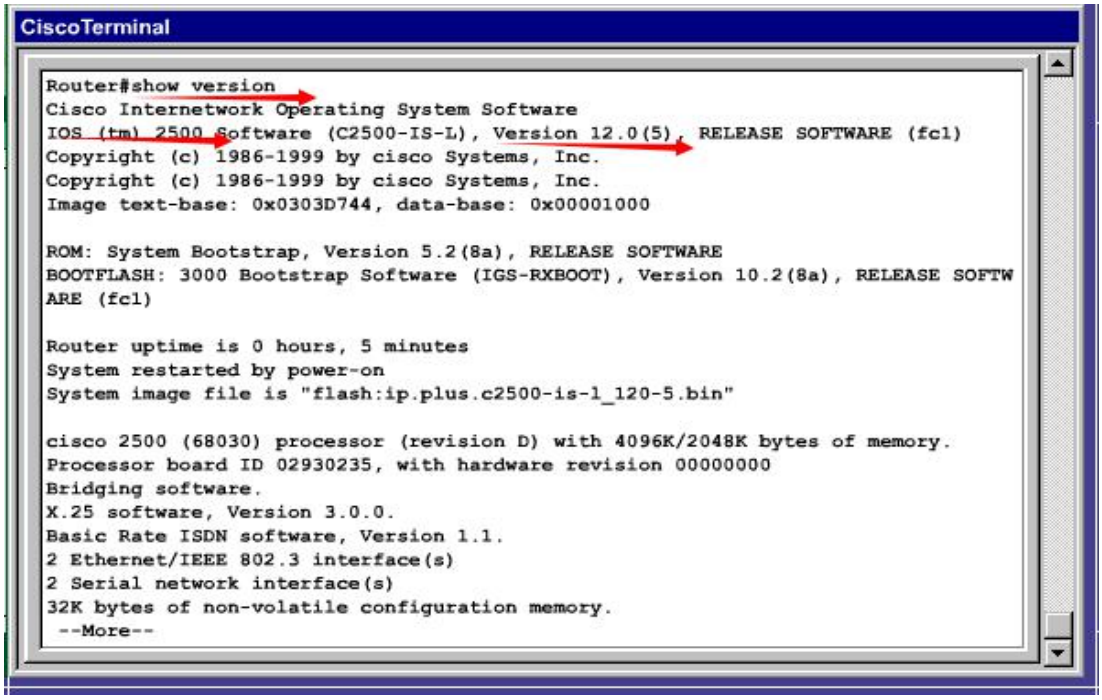
CiscoTerminal

```
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
!
interface Ethernet1
```

2.show interfaces

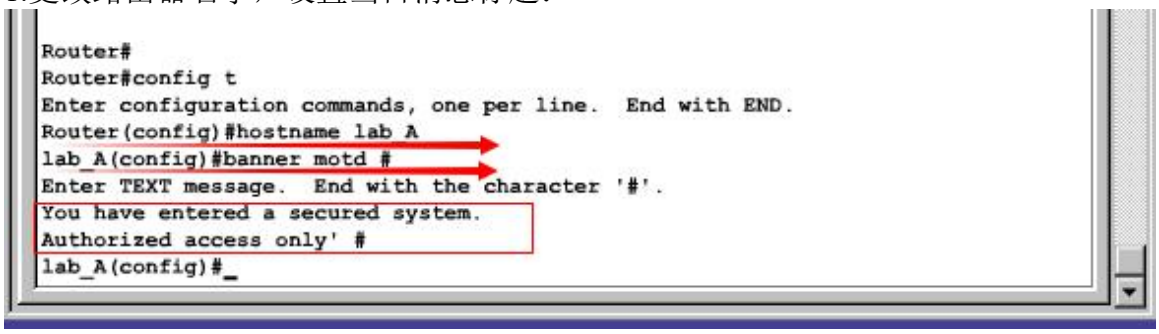


3.show version

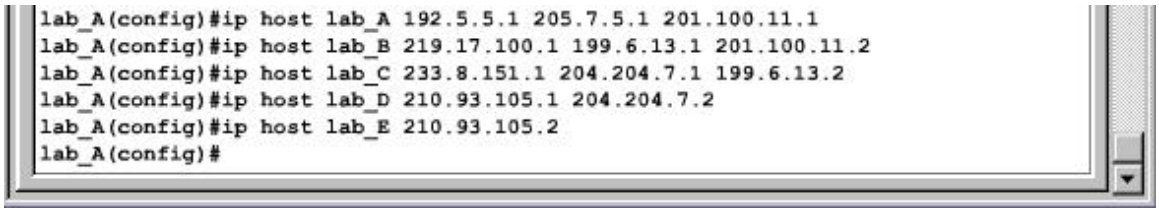


（3）路由器一些常规配置

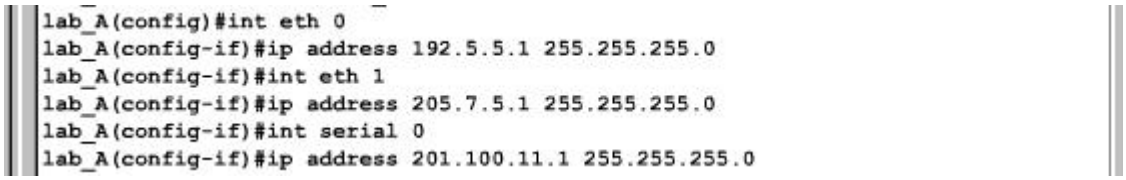
1.更改路由器名字，设置当日消息标题：



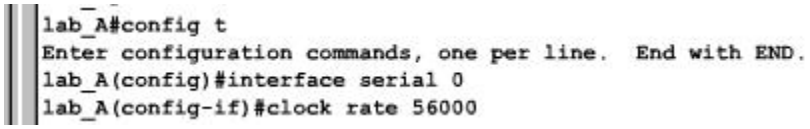
2.建立 ip 地址映射表

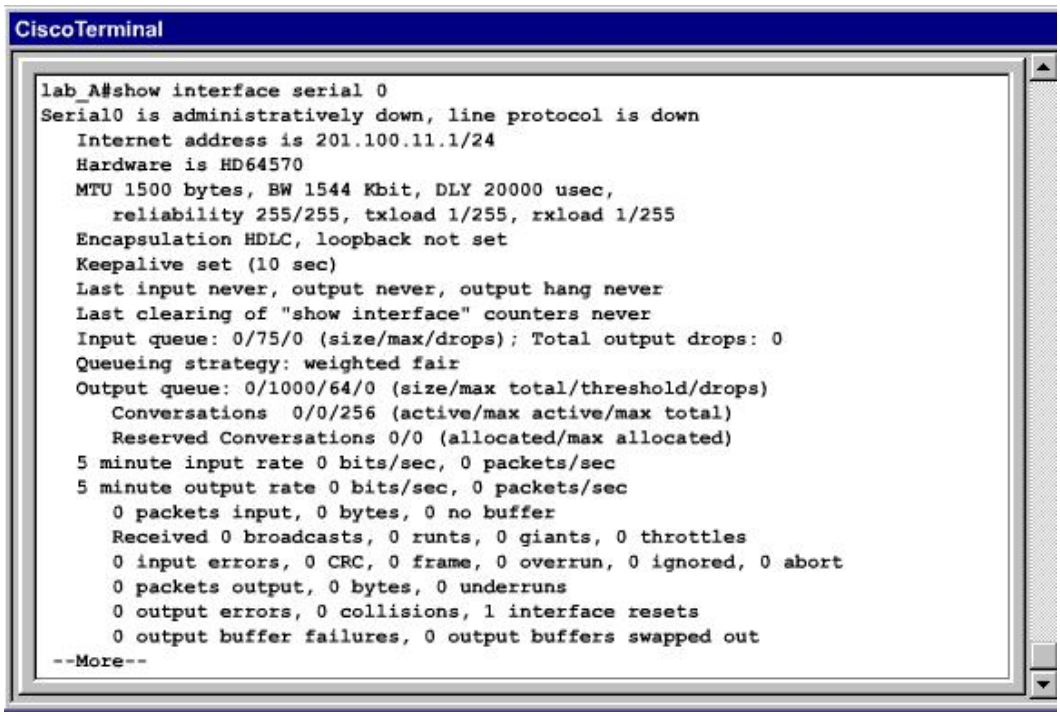


3.给路由器接口配置 ip 地址



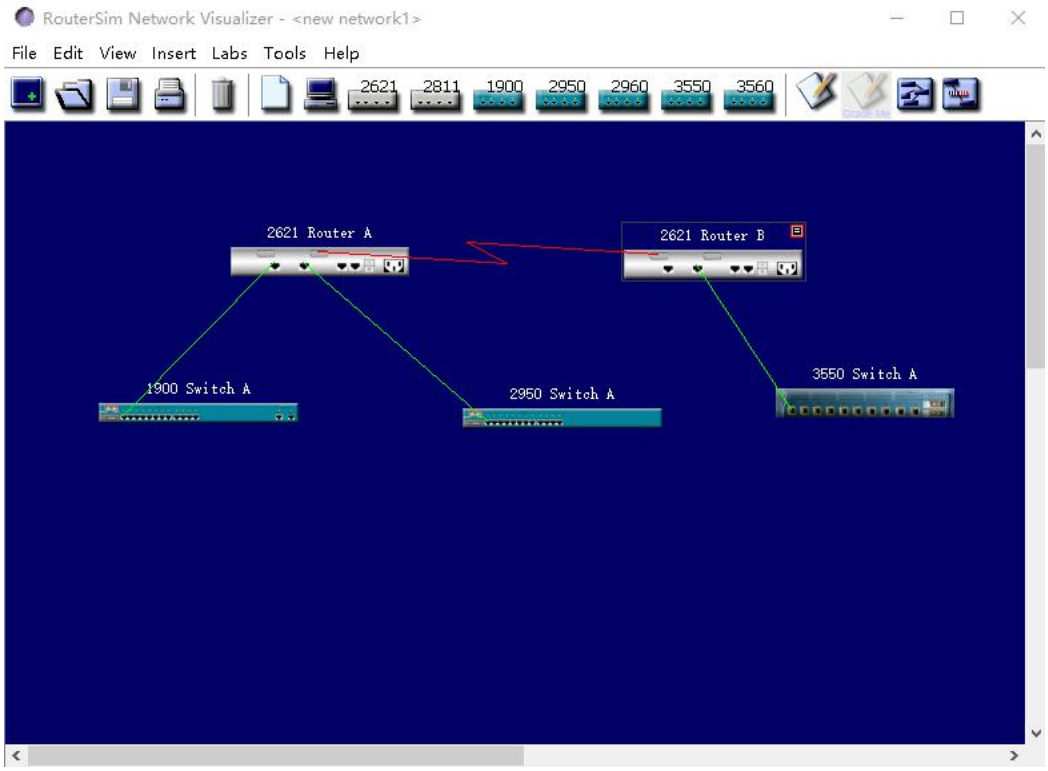
4.配置充当 DCE 端的串行端口，查看串口配置情况



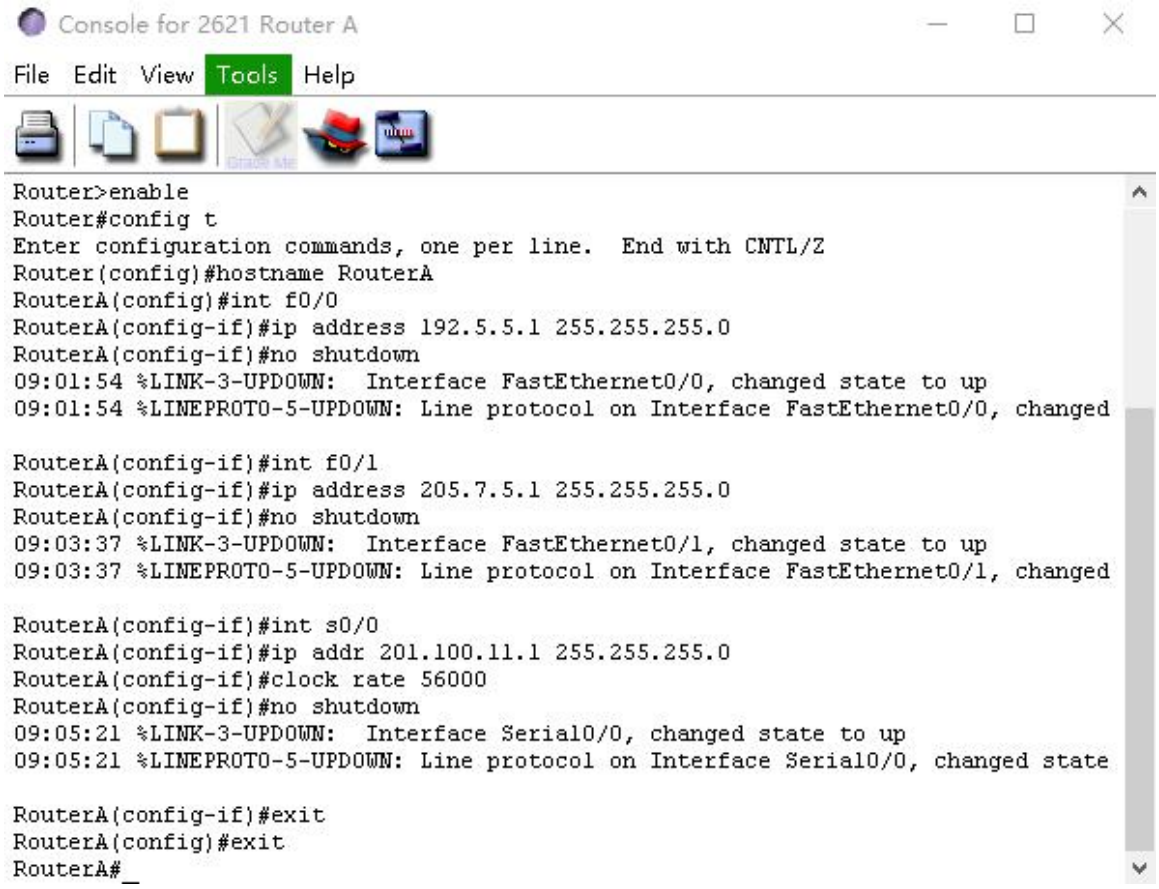


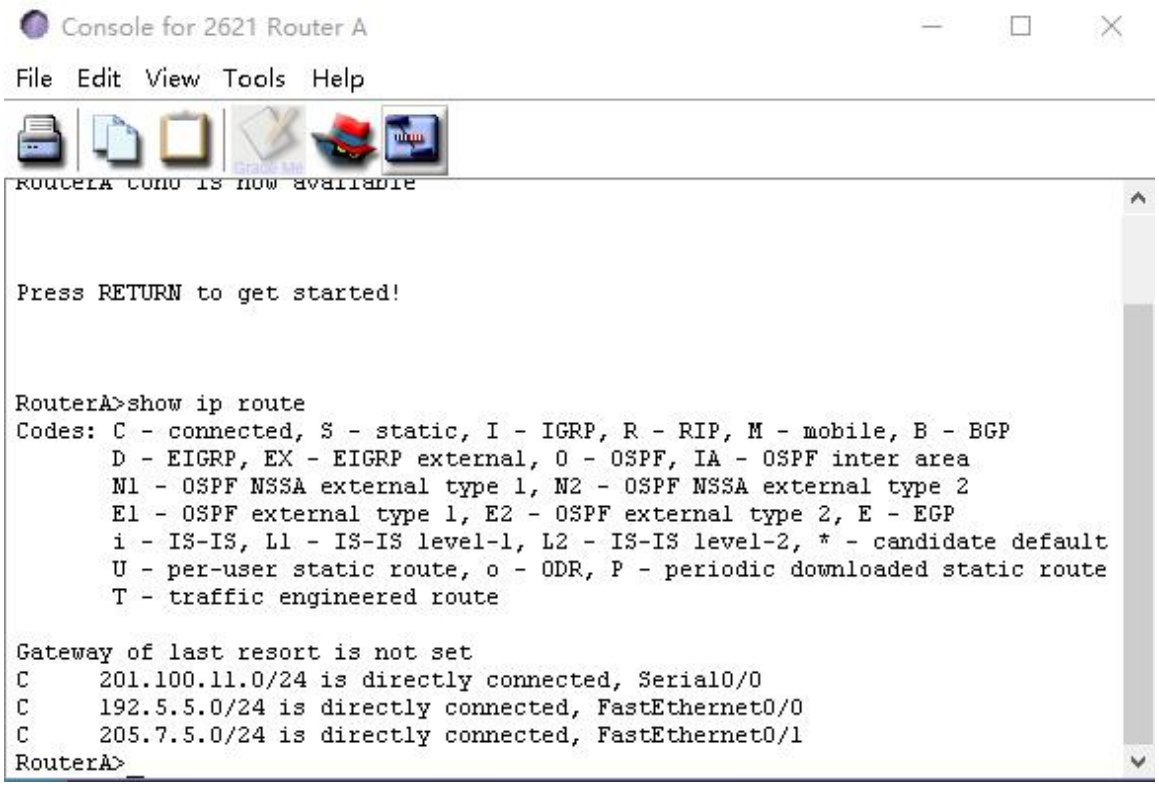
2、静态路由配置

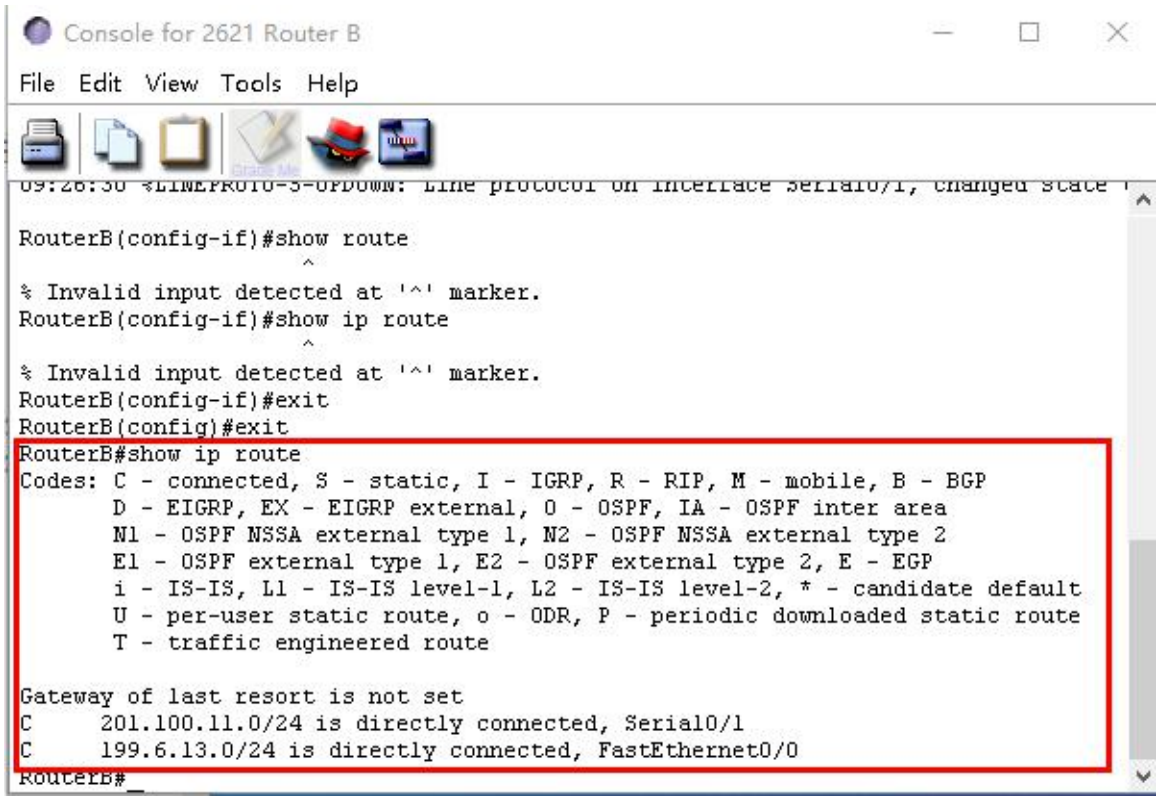
（1）在模拟器上进行实验设备的连接

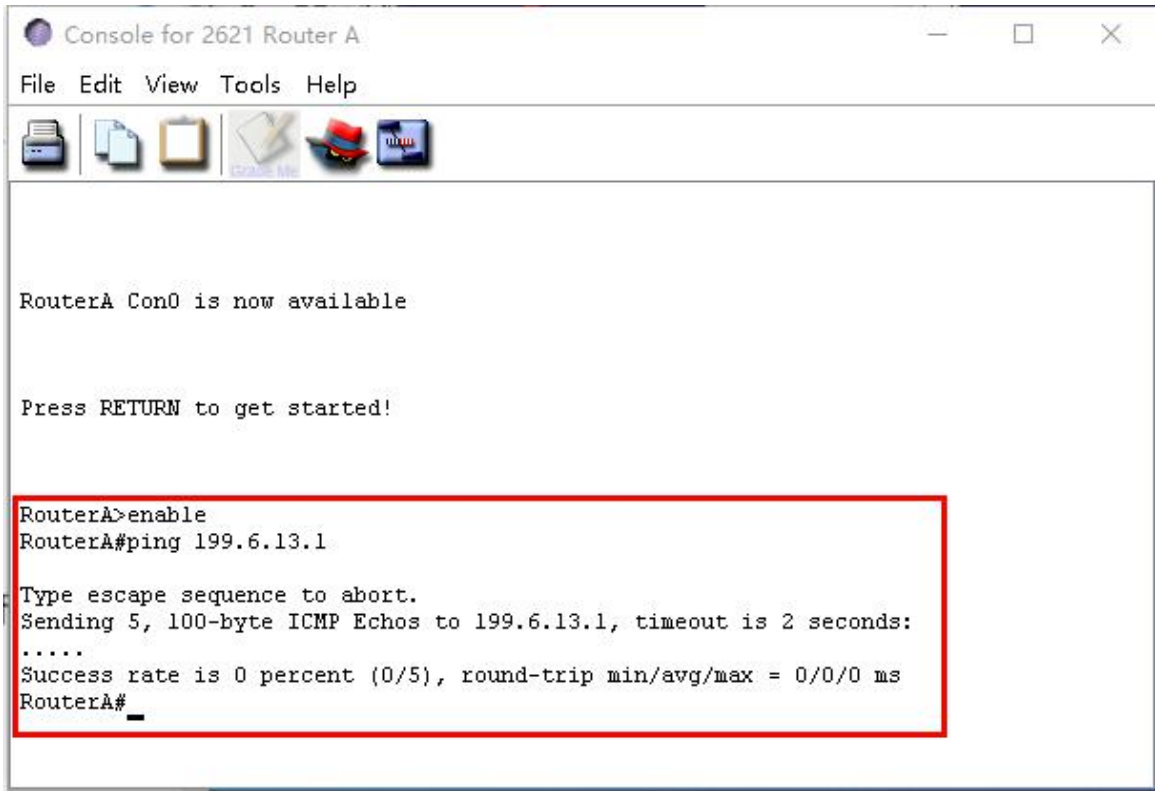


（2）进行静态路由配置之前的工作

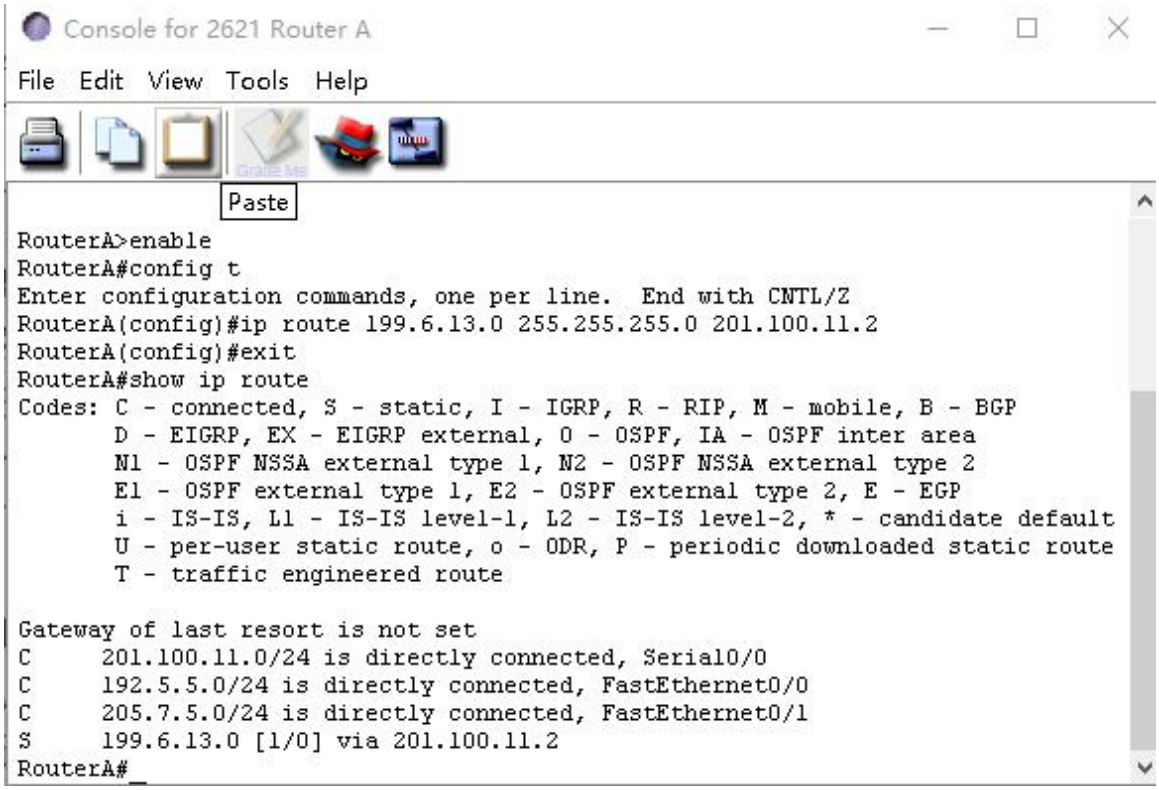



Console for 2621 Router A
File Edit View Tools Help
RouterA con0 is now available
Press RETURN to get started!
RouterA>show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, 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 201.100.11.0/24 is directly connected, Serial0/0
C 192.5.5.0/24 is directly connected, FastEthernet0/0
C 205.7.5.0/24 is directly connected, FastEthernet0/1
RouterA>

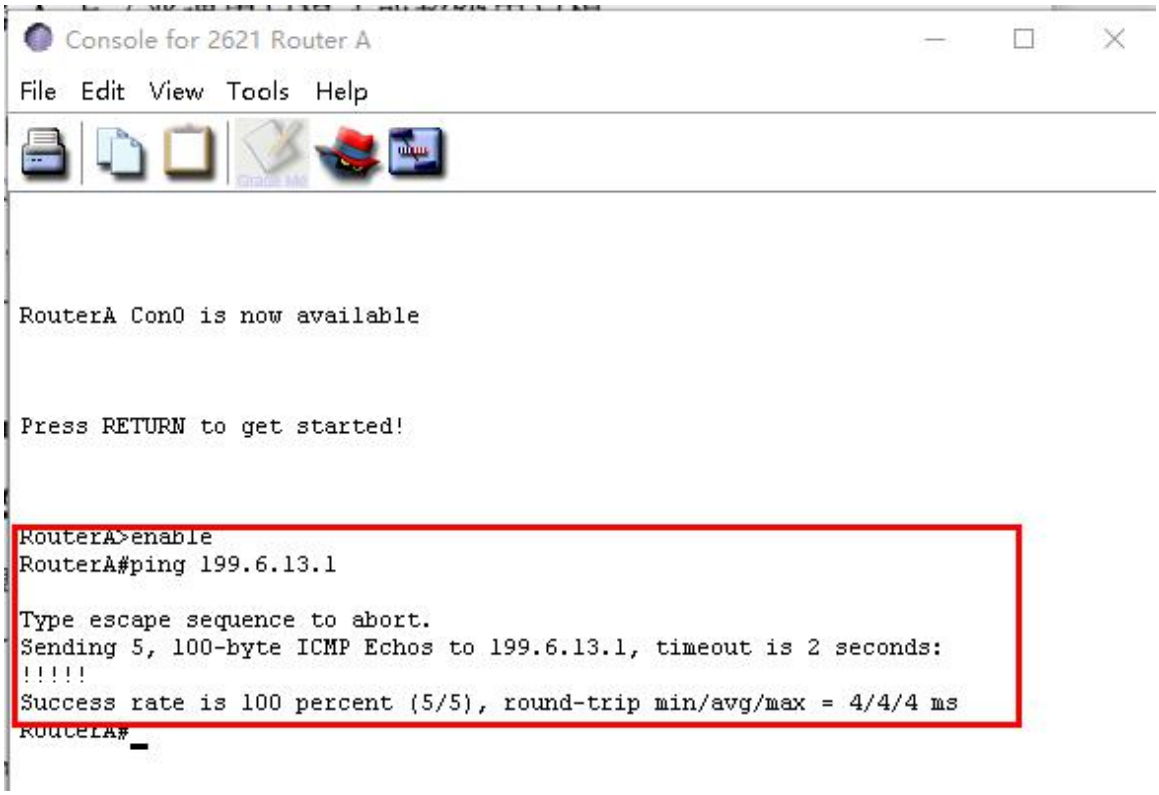

Console for 2621 Router B
File Edit View Tools Help
RouterB(config-if)#show route
% Invalid input detected at '^' marker.
RouterB(config-if)#show ip route
% Invalid input detected at '^' marker.
RouterB(config-if)#exit
RouterB(config)#exit
RouterB#show ip route
Codes: C - connected, S - static, I - IGRP, 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 201.100.11.0/24 is directly connected, Serial0/1
C 199.6.13.0/24 is directly connected, FastEthernet0/0
RouterB#


Console for 2621 Router A
File Edit View Tools Help
RouterA Con0 is now available
Press RETURN to get started!
RouterA>enable
RouterA#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
RouterA#

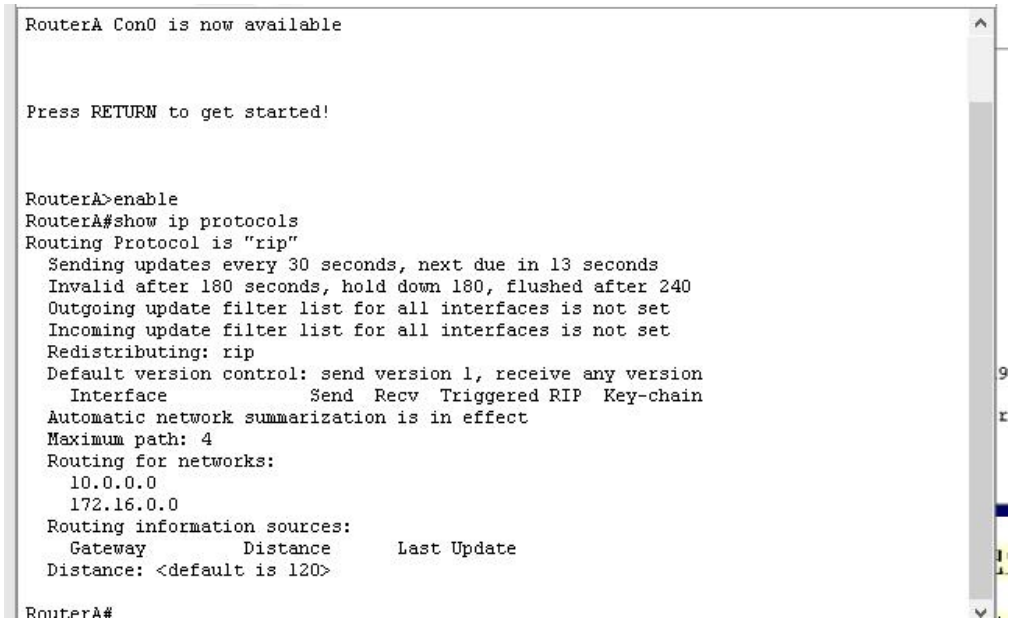
（3）配置静态路由


Console for 2621 Router A
File Edit View Tools Help
Paste
RouterA>enable
RouterA#config t
Enter configuration commands, one per line. End with CNTL/Z
RouterA(config)#ip route 199.6.13.0 255.255.255.0 201.100.11.2
RouterA(config)#exit
RouterA#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 201.100.11.0/24 is directly connected, Serial0/0
C 192.5.5.0/24 is directly connected, FastEthernet0/0
C 205.7.5.0/24 is directly connected, FastEthernet0/1
S 199.6.13.0 [1/0] via 201.100.11.2
RouterA#

（4）检验连通性

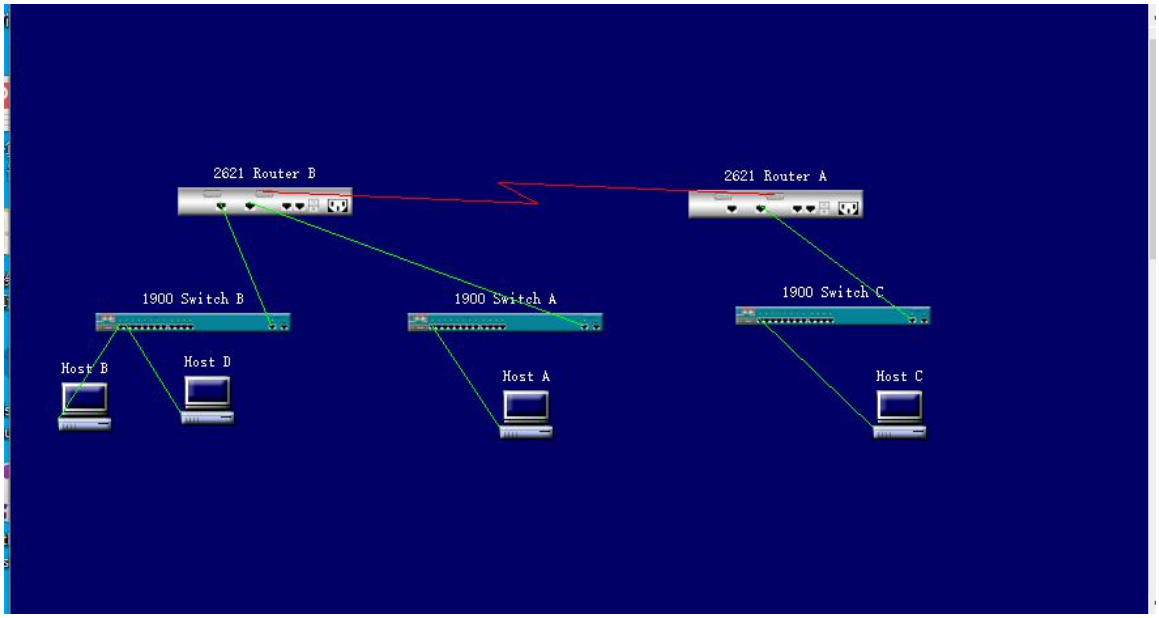


3、动态路由协议 RIP 的配置



4、Cisco 路由器访问列表配置

（1）实验环境配置

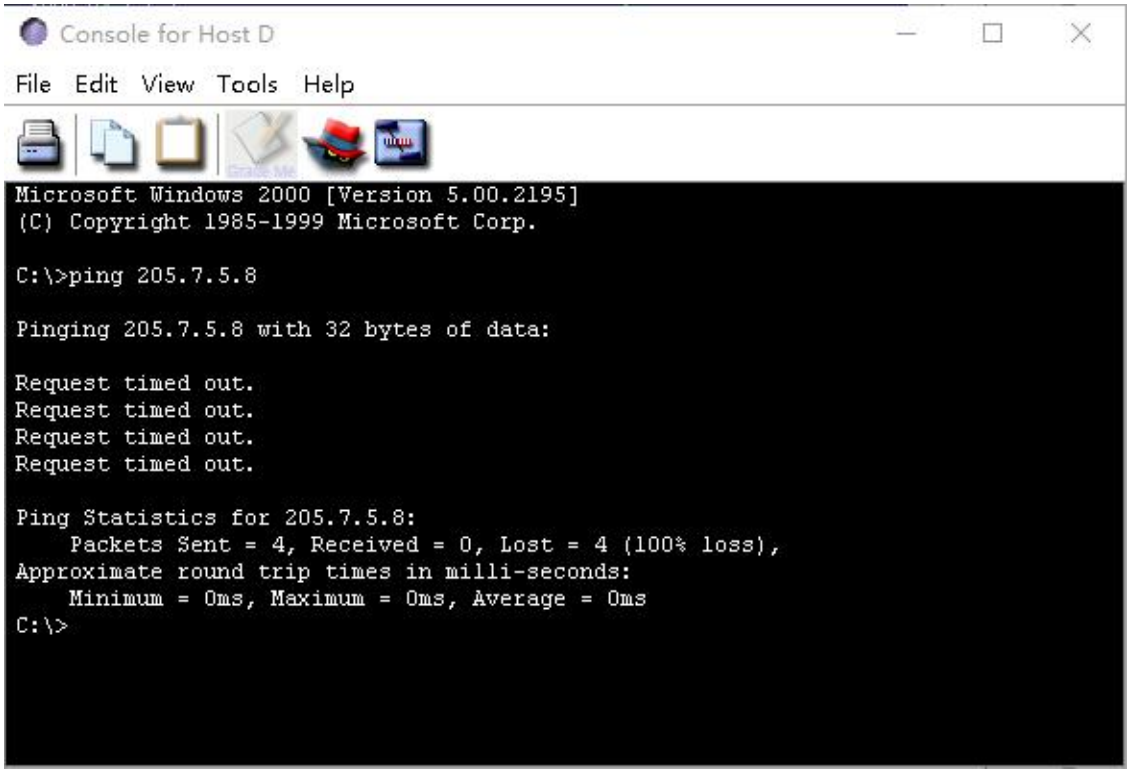



```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z
Router(config)#hostname RouterA
RouterA(config)#line console 0
RouterA(config-line)#password koalaA
RouterA(config-line)#login
RouterA(config-line)#exit
RouterA(config)#line vty 0 4
RouterA(config-line)#password secret ciscoA
RouterA(config-line)#int f0/0
RouterA(config-if)#ip address 199.6.13.1 255.255.255.0
RouterA(config-if)#no shutdown
15:01:00 %LINK-3-UPDOWN:  Interface FastEthernet0/0, changed state to up
15:01:00 %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed stat

RouterA(config-if)#int s0/1
RouterA(config-if)#ip address 201.100.11.2 255.255.255.0
RouterA(config-if)#no shutdown
15:01:35 %LINK-3-UPDOWN:  Interface Serial0/1, changed state to up
15:01:35 %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1, changed state to u

RouterA(config-if)#
```

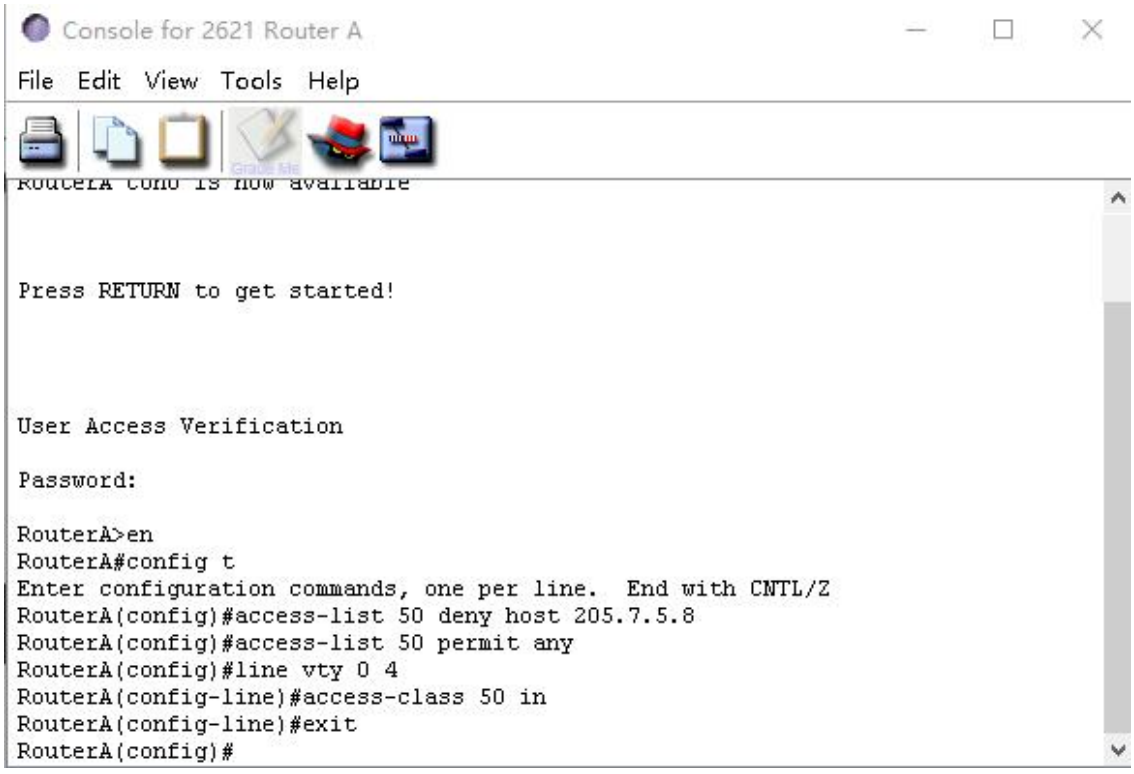
```
User Access Verification

Password:

RouterB>config t
       ^
% Invalid input detected at '^' marker.
RouterB>en
Password:
Password:
Password:
% Bad Secrets

RouterB>enable
Password:
RouterB#config t
Enter configuration commands, one per line.  End with CNTL/Z
RouterB(config)#router rip
RouterB(config-router)#network 192.5.5.0
RouterB(config-router)#network 205.7.5.0
RouterB(config-router)#network 201.100.11.0
RouterB(config-router)#exit
RouterB(config)#
```

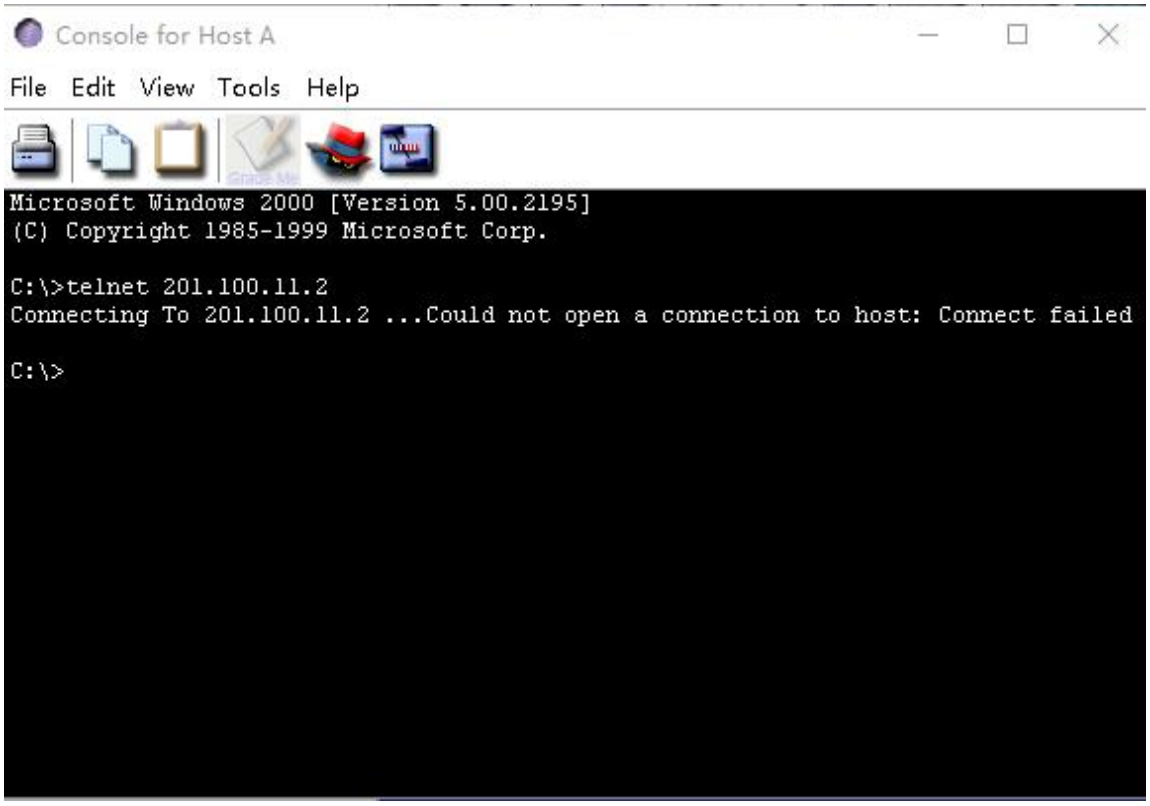
2.利用标准访问列表限制主机 HostB 访问 205.7.5.0


```
Press RETURN to get started!



User Access Verification

Password:

RouterB>en
Password:
Password:
RouterB#config t
Enter configuration commands, one per line.  End with CNTL/Z
RouterB(config)#access-list 50 deny host 192.5.5.6
RouterB(config)#access-list 50 permit any
RouterB(config)#int f0/1
RouterB(config-if)#ip access-group 50 out
RouterB(config-if)#exit
RouterB(config)#
```



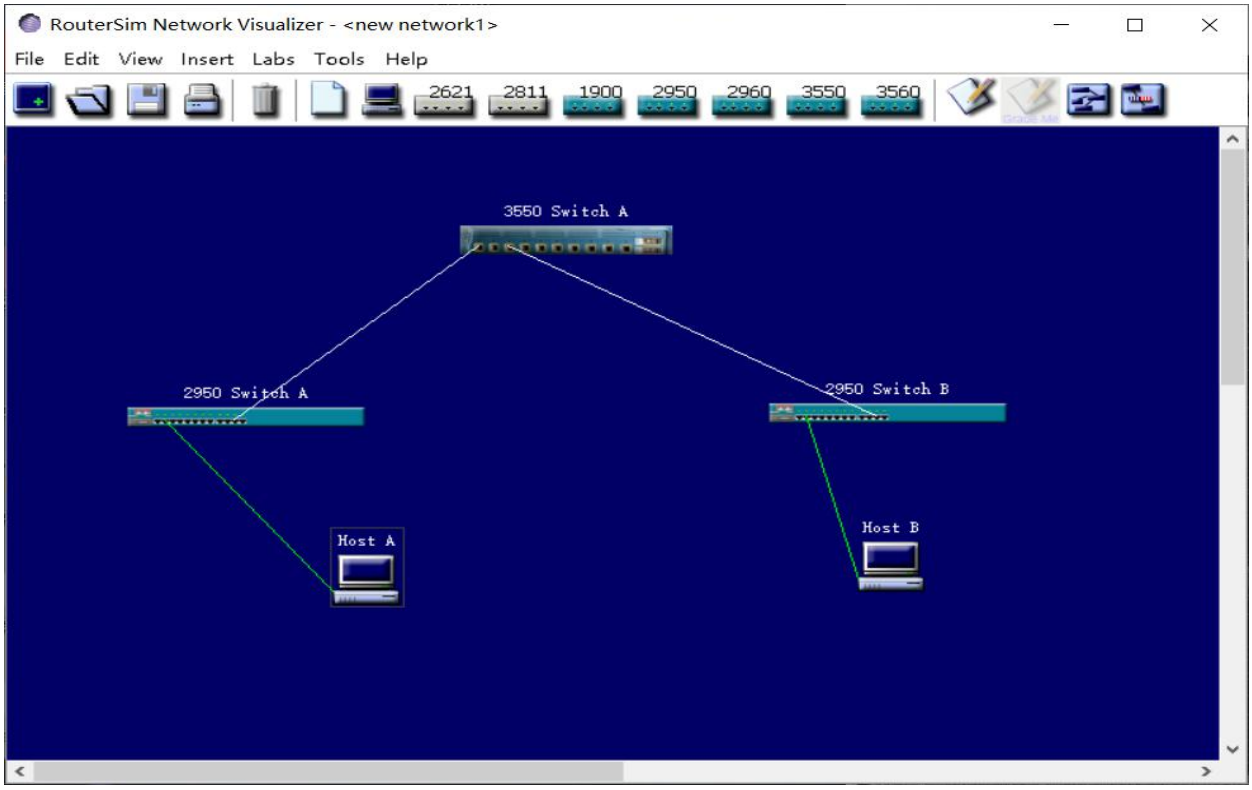
3.配置 Router A，使 Host A 不能 Telnet 到 Router A 上。

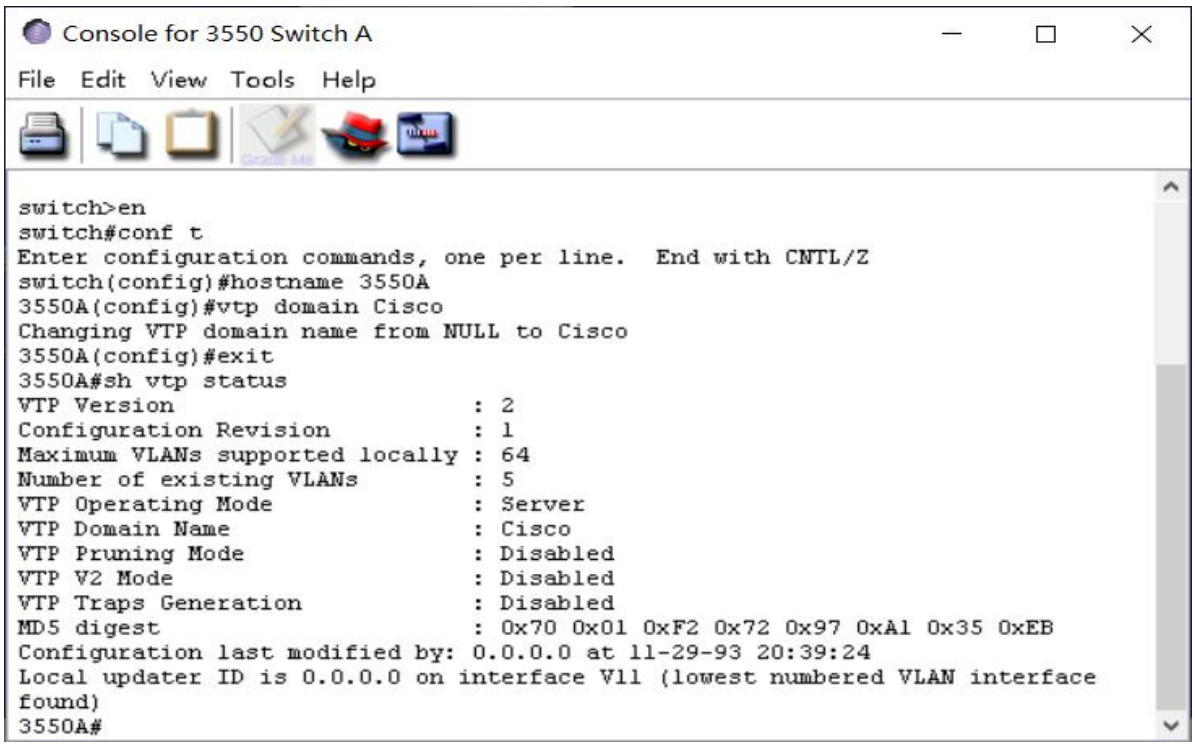


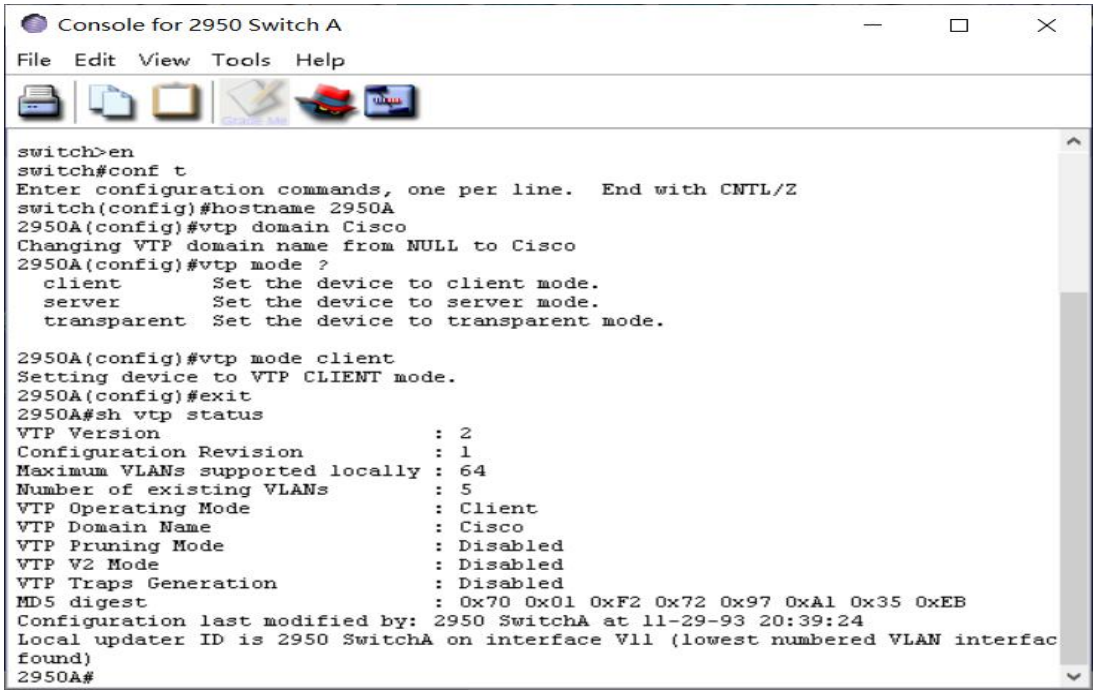

Console for Host A
File Edit View Tools Help
Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright 1985-1999 Microsoft Corp.
C:\>telnet 201.100.11.2
Connecting To 201.100.11.2 ...Could not open a connection to host: Connect failed
C:\>

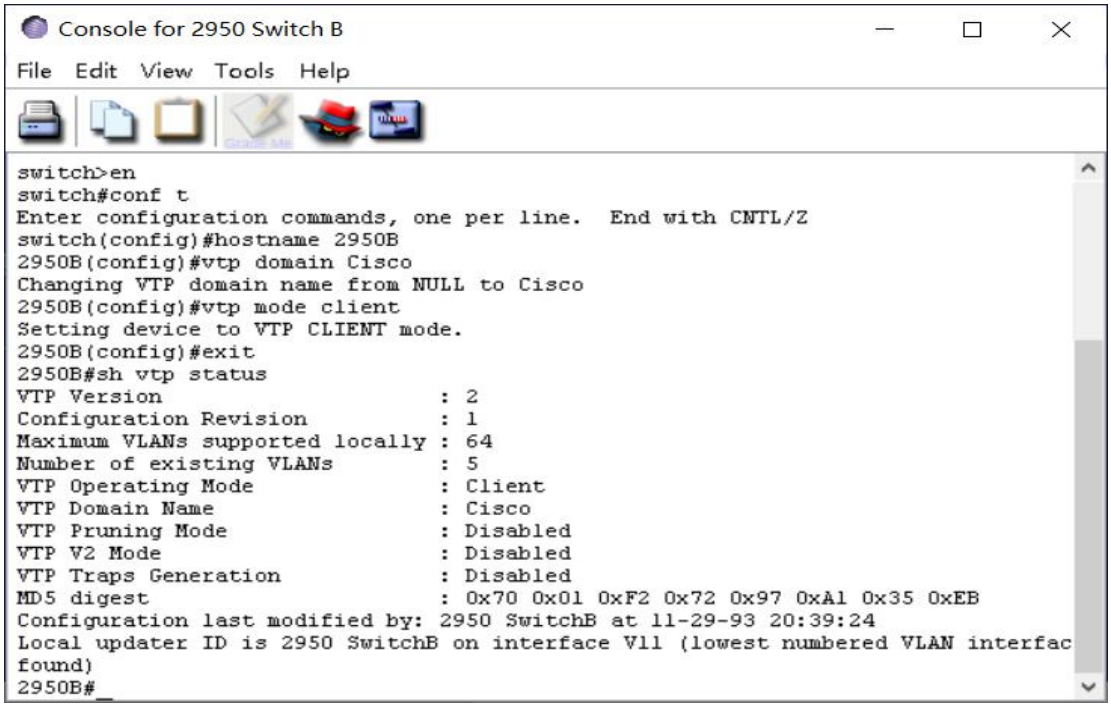
5、基于交换机端口的 VLAN 设置

（1）实例一配置：






Console for 2950 Switch A
File Edit View Tools Help
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#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 SwitchA at 11-29-93 20:39:24
Local updater ID is 2950 SwitchA on interface Vl1 (lowest numbered VLAN interfac
found)
2950A#


Console for 2950 Switch B
File Edit View Tools Help
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
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 Vl1 (lowest numbered VLAN interfac
found)
2950B#

2.启动 Trunk：

```
3550A(config)#interface fa0/1
3550A(config-if)#switchport trunk encapsulation ?
  dotlq      Interface uses only 802.1q trunking encapsulation when trunking
  isl        Interface uses only ISL trunking encapsulation when trunking
  negotiate  Device will negotiate trunking encapsulation with peer on
             interface

3550A(config-if)#switchport trunk encapsulation dotlq
05:39:37: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state
to down
05:39:37: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
3550A(config-if)#switchport mode trunk
3550A(config-if)#interface fa0/3
3550A(config-if)#switchport trunk encapsulation dotlq
05:41:12: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state
to down
05:41:12: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to up
3550A(config-if)#switchport mode trunk
```

```
2950A(config)#interface fa0/11
2950A(config-if)#switchport mode trunk
```

```
2950B(config)#interface fa0/11
2950B(config-if)#switchport mode trunk
```

3.创建 VLAN

```
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

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
```

4.分配交换机端口加入 VLAN：

```
2950A(config)#interface fa0/2
2950A(config-if)#switchport access vlan 10
```

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

5.配置第三层交换机：

```
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
```

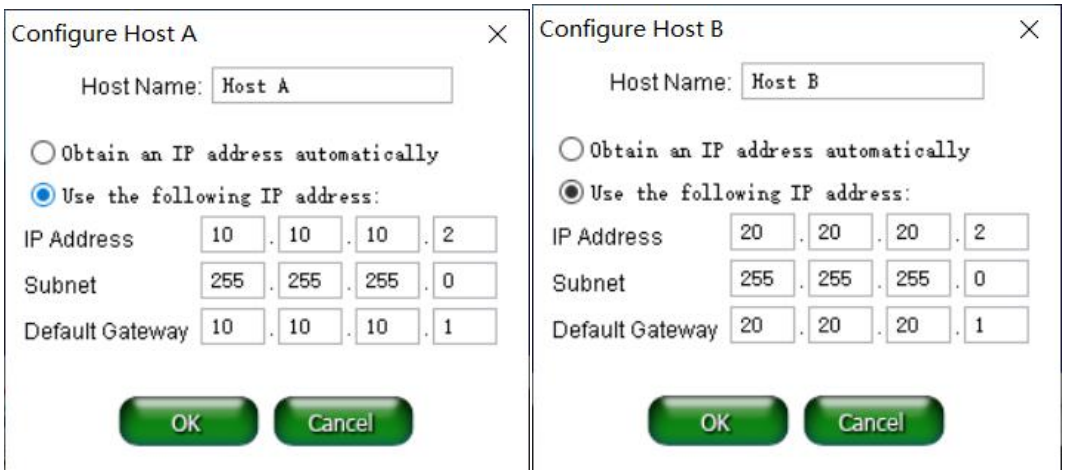
6.配置各交换机的管理地址：

```
3550A(config-if)#int vlan 1
3550A(config-if)#ip address 192.168.10.1 255.255.255.0
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 shut
```

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

7.配置主机 Host A 和 Host B：



8.验证连通性

交换机上：

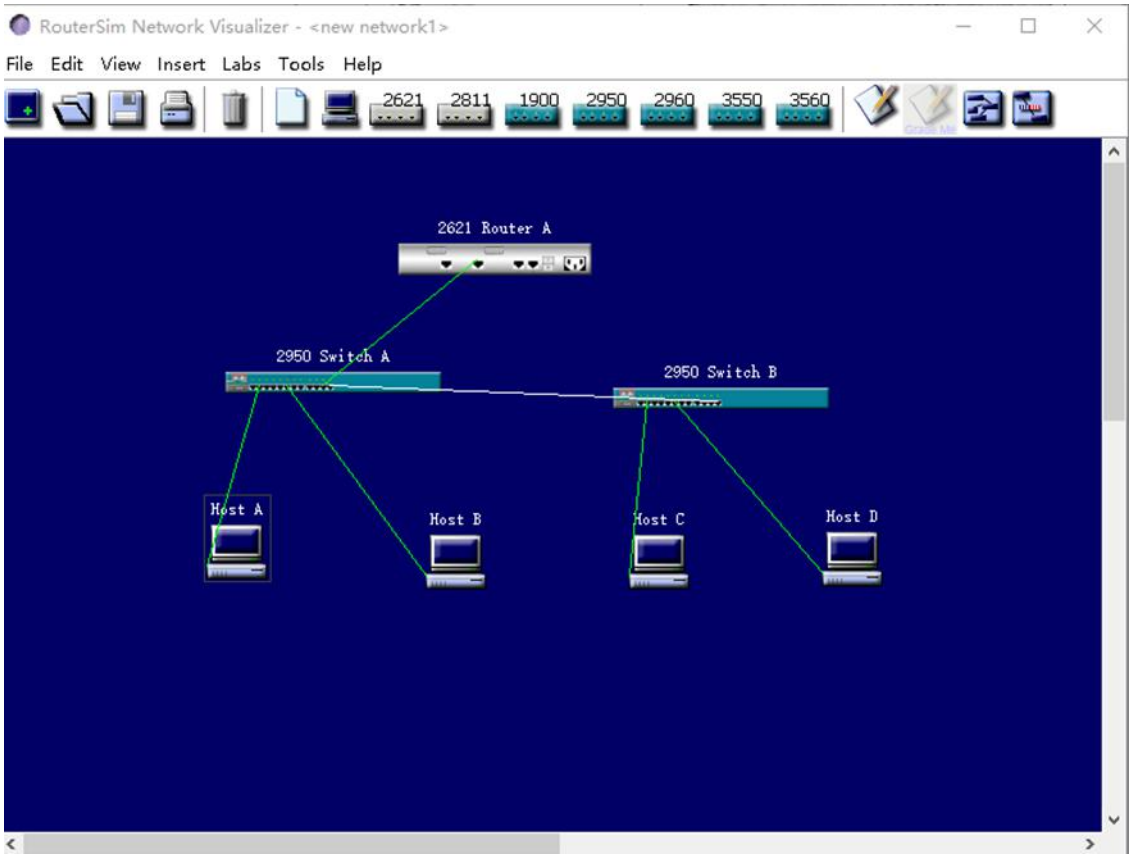
```
3550A>en
3550A#ping 192.168.10.2

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
```

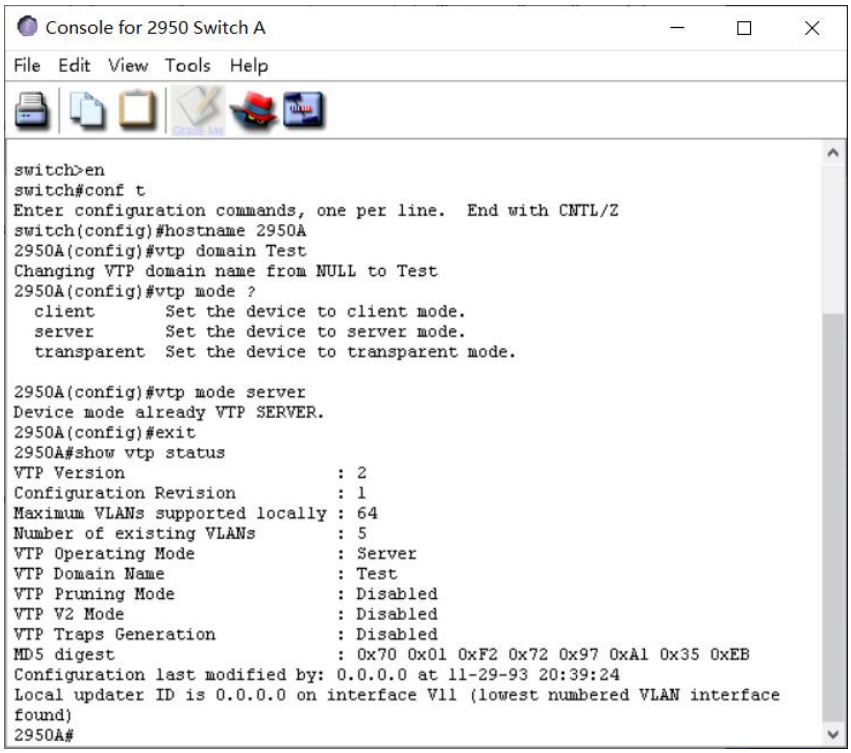
主机 Host A ping 主机 Host B：

```
C:\>ping 20.20.20.2

Pinging 20.20.20.2 with 32 bytes of data:

Reply from 20.20.20.2 ;bytes=32 time=22ms TTL=254
Reply from 20.20.20.2 ;bytes=32 time=22ms TTL=254
Reply from 20.20.20.2 ;bytes=32 time=22ms TTL=254
Reply from 20.20.20.2 ;bytes=32 time=22ms TTL=254

Ping Statistics for 20.20.20.2:
    Packets Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 22ms, Maximum = 23ms, Average = 22ms
```

（2）实例二：

1.配置：


RouterSim Network Visualizer - <new network1>
File Edit View Insert Labs Tools Help
2621 Router A
2950 Switch A
2950 Switch B
Host A
Host B
Host C
Host D


Console for 2950 Switch A
File Edit View Tools Help
switch>en
switch#conf t
Enter configuration commands, one per line. End with CNTL/Z
switch(config)#hostname 2950A
2950A(config)#vtp domain Test
Changing VTP domain name from NULL to Test
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 server
Device mode already VTP SERVER.
2950A(config)#exit
2950A#show 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 : Test
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 Vl1 (lowest numbered VLAN interface found)
2950A#

2.启动 Trunk：

```
switch>en
switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z
switch(config)#hostname 2950B
2950B(config)#interface fa0/12
2950B(config-if)#switchport mode trunk
2950B(config-if)#exit
2950B(config)#_
```

```
2950A#config t
Enter configuration commands, one per line.  End with CNTL/Z
2950A(config)#interface fa0/12
2950A(config-if)#switchport mode?
mode
2950A(config-if)#switchport mode ?
  access   Set trunking mode to ACCESS unconditionally
  dynamic  Set trunking mode to dynamically negotiate access or trunk mode
  trunk    Set trunking mode to TRUNK unconditionally

2950A(config-if)#switchport mode trunk
2950A(config-if)#interface fa0/11
2950A(config-if)#switchport mode trunk
2950A(config-if)#exit
2950A(config)#
```

3.创建 VLAN：

```
2950A#vlan database
2950A(vlan)#vlan 2 name vlan2
VLAN 2 added:
    Name: vlan2
2950A(vlan)#vlan 3 name vlan3
VLAN 3 added:
    Name: vlan3
2950A(vlan)#exit
APPLY completed.
```

4.分配端口到 VLAN：

将 2950A 的端口加入 VLAN：

```
2950A#config t
Enter configuration commands, one per line.  End with CNTL/Z
2950A(config)#interface fastethernet 0/2
2950A(config-if)#switchport access vlan 2
2950A(config-if)#switchport mode access
2950A(config-if)#interface fastethernet 0/6
2950A(config-if)#switchport access vlan 3
2950A(config-if)#switchport mode access
```

```
2950A#show vlan

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/1, Fa0/3, Fa0/4, Fa0/5
                                                Fa0/7, Fa0/8, Fa0/9, Fa0/10
2    vlan2                            active    Fa0/2
3    vlan3                            active    Fa0/6
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
2    enet  100002     1500  -      -      -        -    -        0      0
3    enet  100003     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

--More--
```

5.配置 VLAN 之间的路由：

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z
Router(config)#hostname R2621
R2621(config)#interface fastethernet 0/0
R2621(config-if)#no ip address
R2621(config-if)#no shutdown
06:31:07 %LINK-3-UPDOWN:  Interface FastEthernet0/0, changed state to up
06:31:07 %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

R2621(config-if)#interface fastethernet 0/0.1
R2621(config-subif)#encapsulation dot1q 1
R2621(config-subif)#ip address 172.16.10.1 255.255.255.0
R2621(config-subif)#interface fastethernet 0/0.2
R2621(config-subif)#encapsulation dot1q 2
R2621(config-subif)#ip address 172.16.20.1 255.255.255.0
R2621(config-subif)#interface fastethernet 0/0.3
R2621(config-subif)#encapsulation dot1q 3
R2621(config-subif)#ip address 172.16.30.1 255.255.255.0
R2621(config-subif)#exit
R2621(config)#
```

6.验证连通性：

在属于 VLAN2 的 Host A 上 ping172.16.20.1：

```
C:\>ping 172.16.20.1

Pinging 172.16.20.1 with 32 bytes of data:

Reply from 172.16.20.1 ;bytes=32 time=22ms TTL=254
Reply from 172.16.20.1 ;bytes=32 time=22ms TTL=254
Reply from 172.16.20.1 ;bytes=32 time=22ms TTL=254
Reply from 172.16.20.1 ;bytes=32 time=22ms TTL=254

Ping Statistics for 172.16.20.1:
    Packets Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 22ms, Maximum = 23ms, Average = 22ms
```

在属于 VLAN3 的 Host B 上 ping172.16.30.1：

```
C:\>ping 172.16.30.1

Pinging 172.16.30.1 with 32 bytes of data:

Reply from 172.16.30.1 ;bytes=32 time=22ms TTL=254
Reply from 172.16.30.1 ;bytes=32 time=22ms TTL=254
Reply from 172.16.30.1 ;bytes=32 time=22ms TTL=254
Reply from 172.16.30.1 ;bytes=32 time=22ms TTL=254

Ping Statistics for 172.16.30.1:
    Packets Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 22ms, Maximum = 23ms, Average = 22ms
```

在 Host A 上 ping Host B：

```
C:\>ping 172.16.30.3

Pinging 172.16.30.3 with 32 bytes of data:

Reply from 172.16.30.3 ;bytes=32 time=22ms TTL=254
Reply from 172.16.30.3 ;bytes=32 time=22ms TTL=254
Reply from 172.16.30.3 ;bytes=32 time=22ms TTL=254
Reply from 172.16.30.3 ;bytes=32 time=22ms TTL=254

Ping Statistics for 172.16.30.3:
    Packets Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 22ms, Maximum = 23ms, Average = 22ms
```

在 Host a 上 ping Host b：

```
C:\>ping 172.16.30.5

Pinging 172.16.30.5 with 32 bytes of data:

Reply from 172.16.30.5 ;bytes=32 time=22ms TTL=254
Reply from 172.16.30.5 ;bytes=32 time=22ms TTL=254
Reply from 172.16.30.5 ;bytes=32 time=22ms TTL=254
Reply from 172.16.30.5 ;bytes=32 time=22ms TTL=254

Ping Statistics for 172.16.30.5:
    Packets Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 22ms, Maximum = 23ms, Average = 22ms
```

4 实验总结

学习了使用 Router eSIM v1.1 模拟器来模拟路由器的配置环境；了解并使用 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）。对交换机，路由器的接口及其配置有了更为深入的了解，对数据如何在主机，交换机及路由器进行交换转发有了进一步的认识。