厦門大學

信息学院软件工程系

《计算机网络》实验报告

题　　目 实验四　CISCO IOS 路由器基本配置

班　　级 软件工程 2019 级 1 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，勿超过 5MB；

4、应将材料清单上传在代码托管平台上；

5、在学期最后一节课前按要求打包发送至 cni21@qq.com。

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。

1. 通过 Router eSIMv1.0 模拟器模拟路由器的配置；

2. 通过 CCNA Network visualizer 6.0 模拟路由情景，配置静态路由，动态路由，VLAN 等

2 实验环境

Windows 10

Router eSIM v1.0

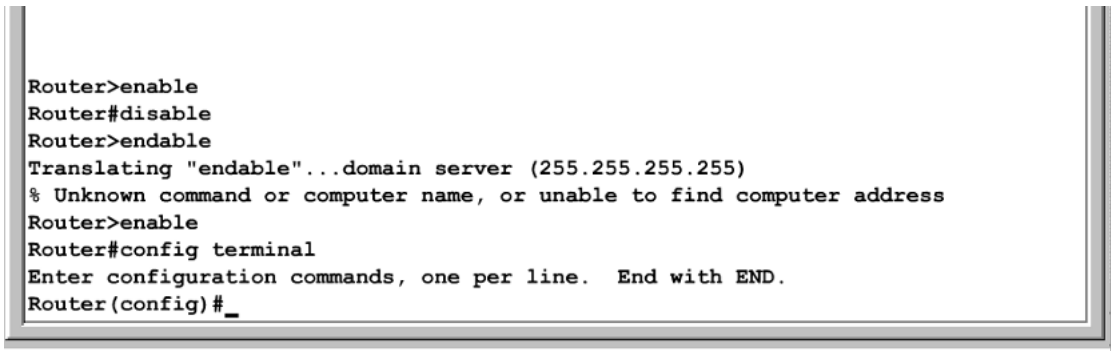
CCNA Network visualizer 6.0

3 实验结果

一，IOS 路由和 VLAN 配置

1. 用户模式切换

在 cisco router sim 中，使用 enable 和 disable 命令来切换超级模式和普通模式，在普通模式下只支持对路由器中的一些状态进行检查，而超级用户（全局模式）模式则支持对路由器中许多地方进行修改，如全局模式中设置路由器名字，配置启动配置 start_up configuration 等。切换截图如下：



>代表普通用户模式，#代表超级用户模式
Router（config）#表示全局模式
2. 查看路由器配置以及版本信息
查看 running-config 和 startup-config

```
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
!
```

```
 session-timeout 60
!
end
Router#
Router#
Router#
Router#
Router#
Router#show startup-config
 %% Non-volatile configuration memory is not present
Router#
```

查看路由器版本：

```
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 SOFTW
ARE (fc1)

Router uptime is 0 hours, 19 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.
2 Ethernet/IEEE 802.3 interface(s)
2 Serial network interface(s)
32K bytes of non-volatile configuration memory.
8192K bytes of processor board System flash (Read ONLY)
 --More--
```

1. 配置路由器 hostname

使用命令：（全局模式下）hostname + 名字

```
Router#
Router#config terminal
Enter configuration commands, one per line.  End with END.
Router(config)#hostname haruki1
haruki1(config)#
haruki1(config)#
haruki1(config)#
haruki1(config)#
```

1. 建立 ip 地址映射表

全局配置 ip 地址映射表在 config 下进行即可，对路由器接口进行配置只需要转至对应的接口模式即可，即使用 interface 接口名。

命令：ip host name address

```
haruki1(config)#
haruki1(config)#ip host haruki1 192.5.5.1 204.7.5.1 201.100.11.1
haruki1(config)#ip host lab_A 192.5.5.1 204.7.5.1 201.100.11.1
haruki1(config)#ip host lab_B 219.17.100.1 199.6.13.1 201.100.11.2
haruki1(config)#
```

为接口配置 ip 地址映射表：

命令: ip address {ip 地址} {子网掩码}

如图：对接口 eth0 和 eth1 进行配置 ip，对串行接口 serial 0 进行 ip 配置

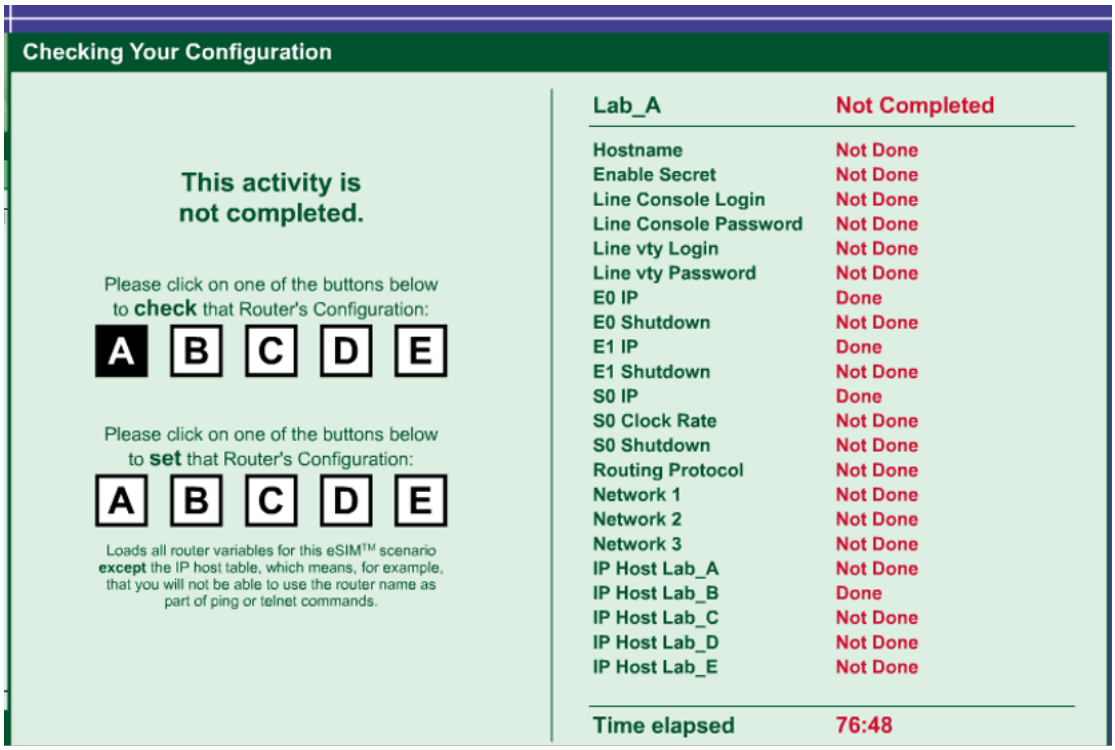
```
haruki1(config)#int eth 0
haruki1(config-if)#ip address 192.5.5.1 255.255.255.0
haruki1(config-if)#int eth 1
haruki1(config-if)#ip address 205.7.5.1 255.255.255.0
haruki1(config-if)#int serial 0
haruki1(config-if)#ip address 201.100.11.1 255.255.255.0
haruki1(config-if)#_
```

1. 查看串行端口的配置情况：

命令：show interface 串口名

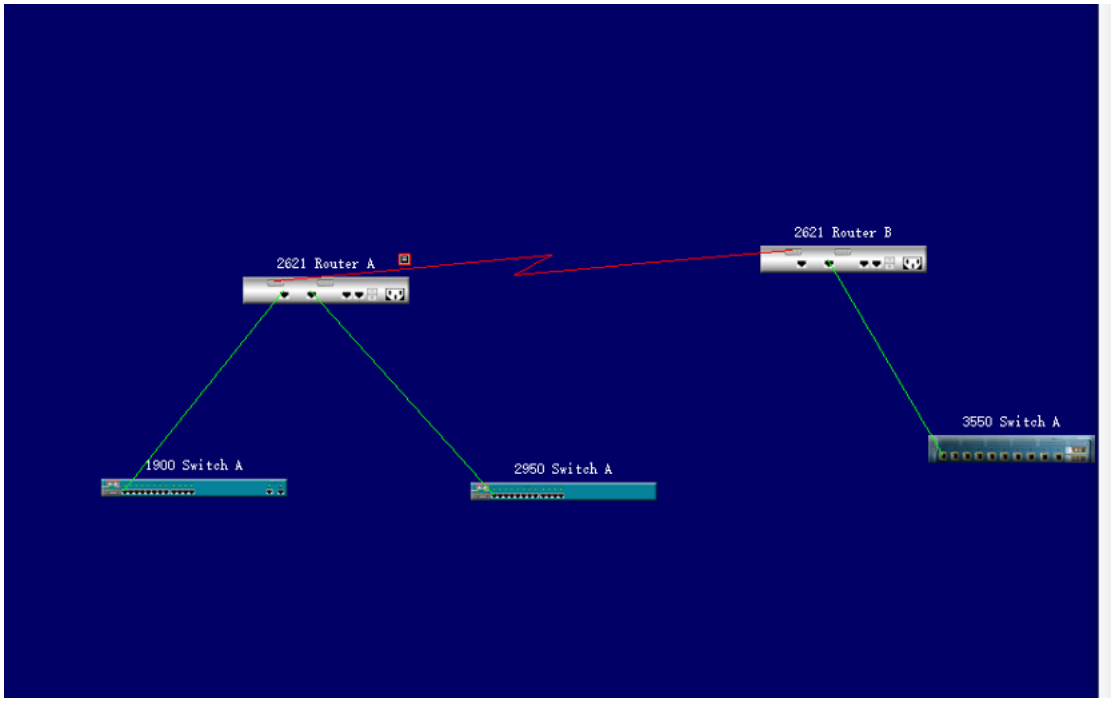
```
haruki1#show controller serial 0
haruki1#show int serial 0
Serial0 is up, line protocol is up
   Internet address is 201.100.11.1/24
   Hardware is HD64570
   MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
      reliability 255/255, txload 1/255, rxload 1/255
   Encapsulation HDLC, loopback not set
   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
```

1. 完成清单如下



二， 静态路由配置

1. 添加路由器和交换机网络



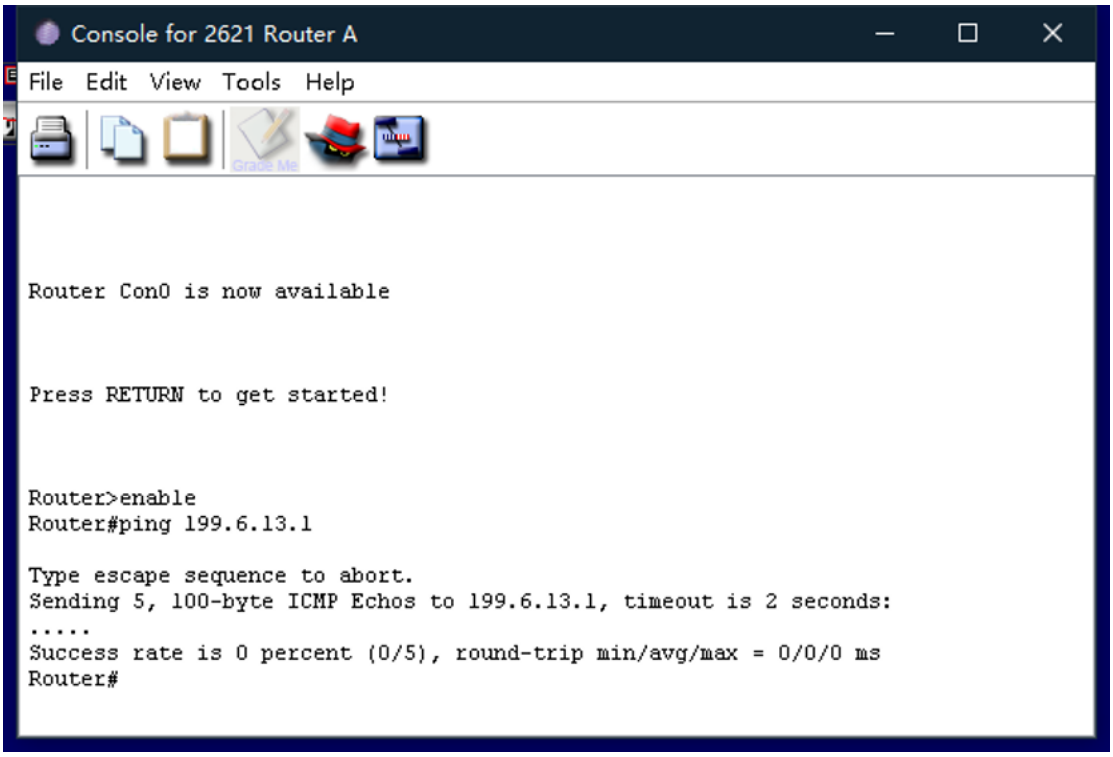
1. 配置各个路由器和交换机

配置路由器 A：

```
Router Con0 is now available


Press RETURN to get started!


Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z
Router(config)#int f0/0
Router(config-if)#ip addr 192.5.5.1 255.255.255.0
Router(config-if)#no shutdown
15:17:21 %LINK-3-UPDOWN:  Interface FastEthernet0/0, changed state to up
15:17:21 %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
% Incomplete command.
Router(config-if)#ip addr 205.7.5.1 255.255.255.0
Router(config-if)#no shutdown
15:17:52 %LINK-3-UPDOWN:  Interface FastEthernet0/1, changed state to up
15:17:52 %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

Router(config-if)#int s0/1
Router(config-if)#ip addr 201.100.11.2 255.255.255.0
Router(config-if)#clock rate 56000
Router(config-if)#no shutdown
15:18:46 %LINK-3-UPDOWN:  Interface Serial0/1, changed state to up
15:18:46 %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     201.100.11.0/24 is directly connected, Serial0/1
C     192.5.5.0/24 is directly connected, FastEthernet0/0
C     205.7.5.0/24 is directly connected, FastEthernet0/1
Router#
```

```
Router(config-if)#int f0/1
Router(config-if)#int f0/0
Router(config-if)#ip addr 199.6.13.1 255.255.255.0
Router(config-if)#no shutdown
15:24:20 %LINK-3-UPDOWN:  Interface FastEthernet0/0, changed state to up
15:24:20 %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, change

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#
```

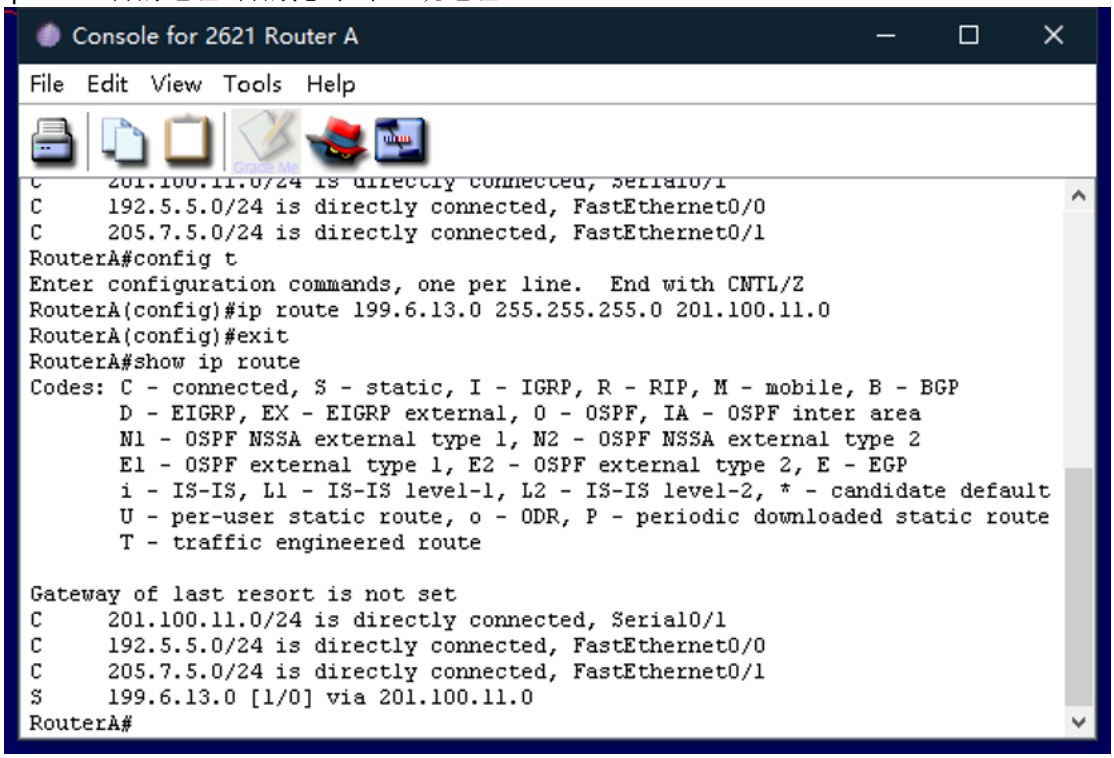
测试连接：



3. 配置静态路由：

配置静态路由使用命令如下：

Ip route 目的地址 目的掩码 下一跳地址

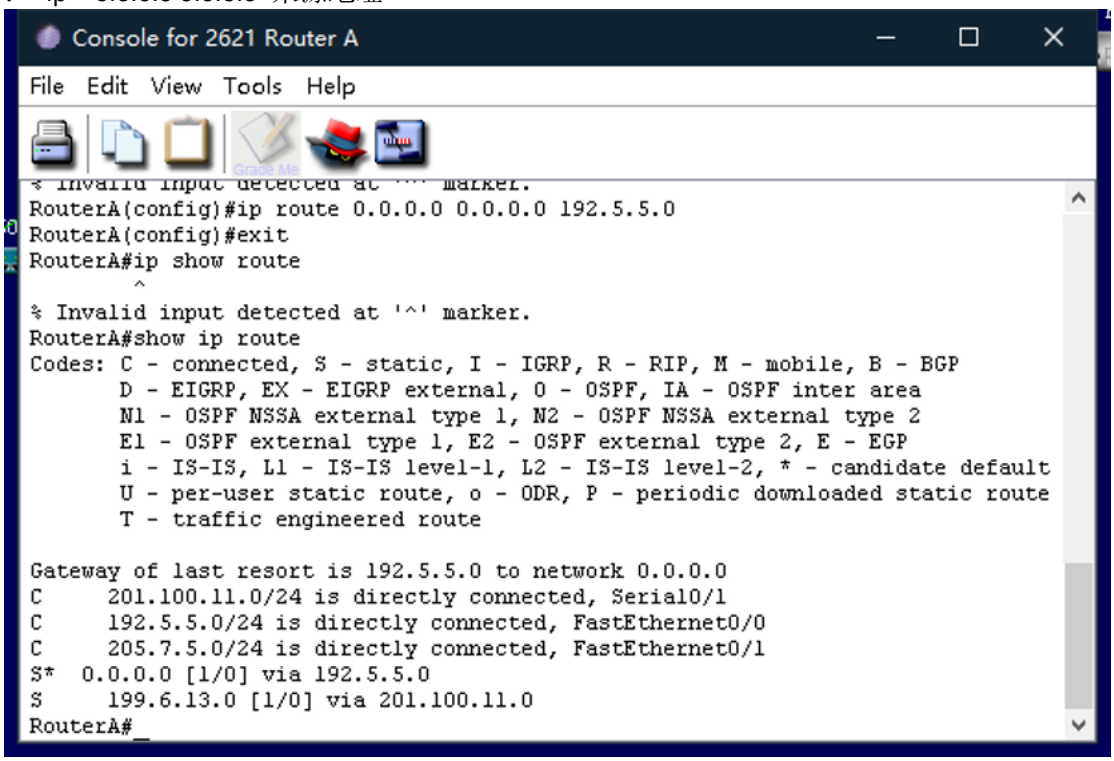


开头字母 S 代表是 static 静态配置得到的地址，一开始的地址代表目的地址，via

后的地址代表是下一跳 hop 地址 1/0 分别代表管理距离和需要经过的跳数

配置默认路由

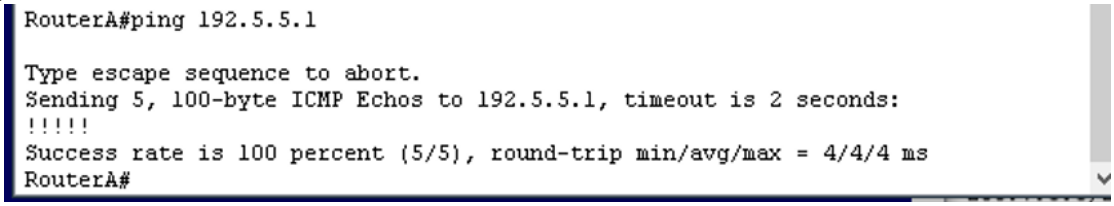
命令： ip 0.0.0.0 0.0.0.0 来源地址

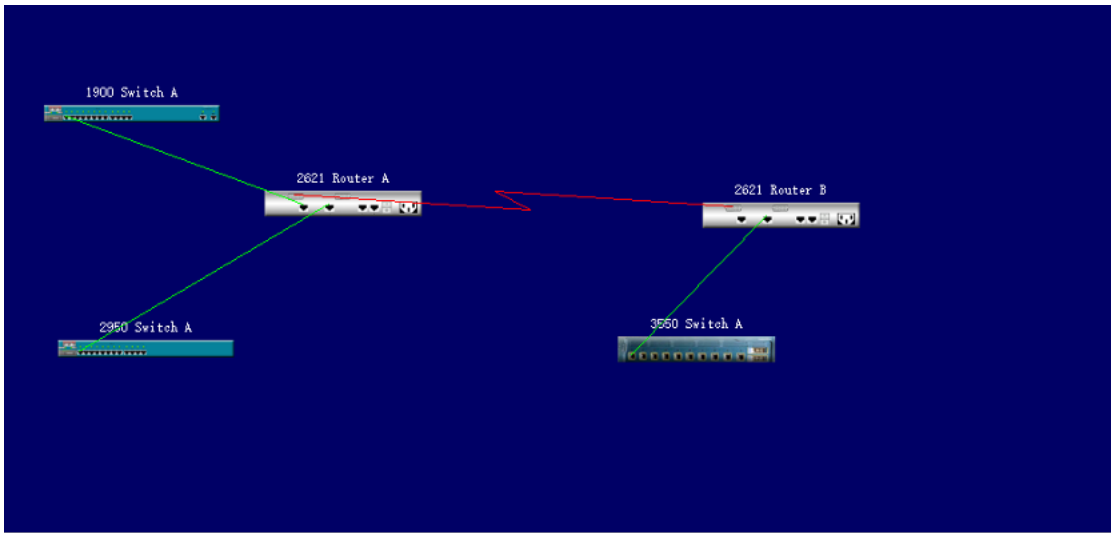


S* 代表是默认路由出口，即未设置出口 ip 的数据包都将经由 201.100.11.0 发送。

5. 检测连通性

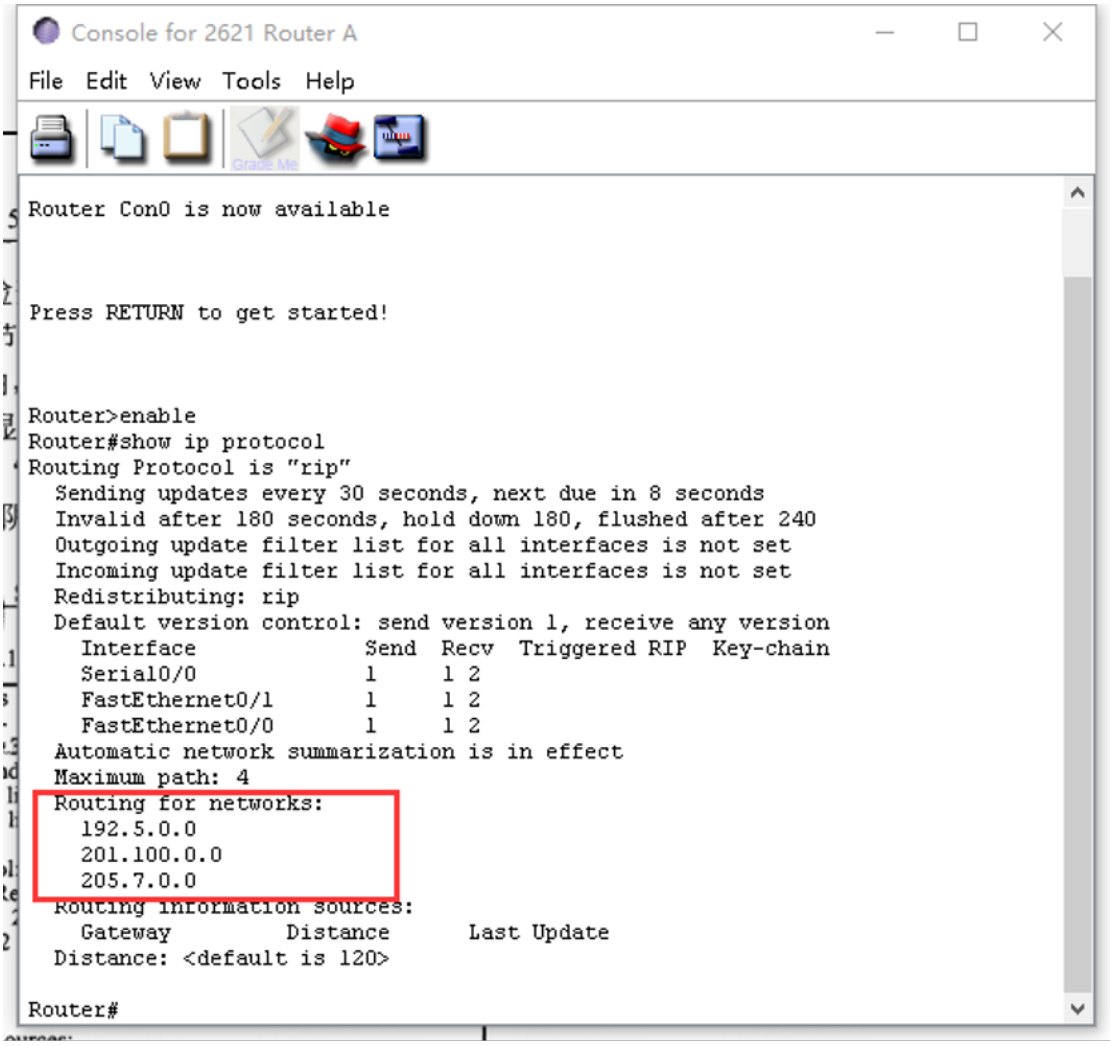
使用 ping 指令进行一个连通性检测

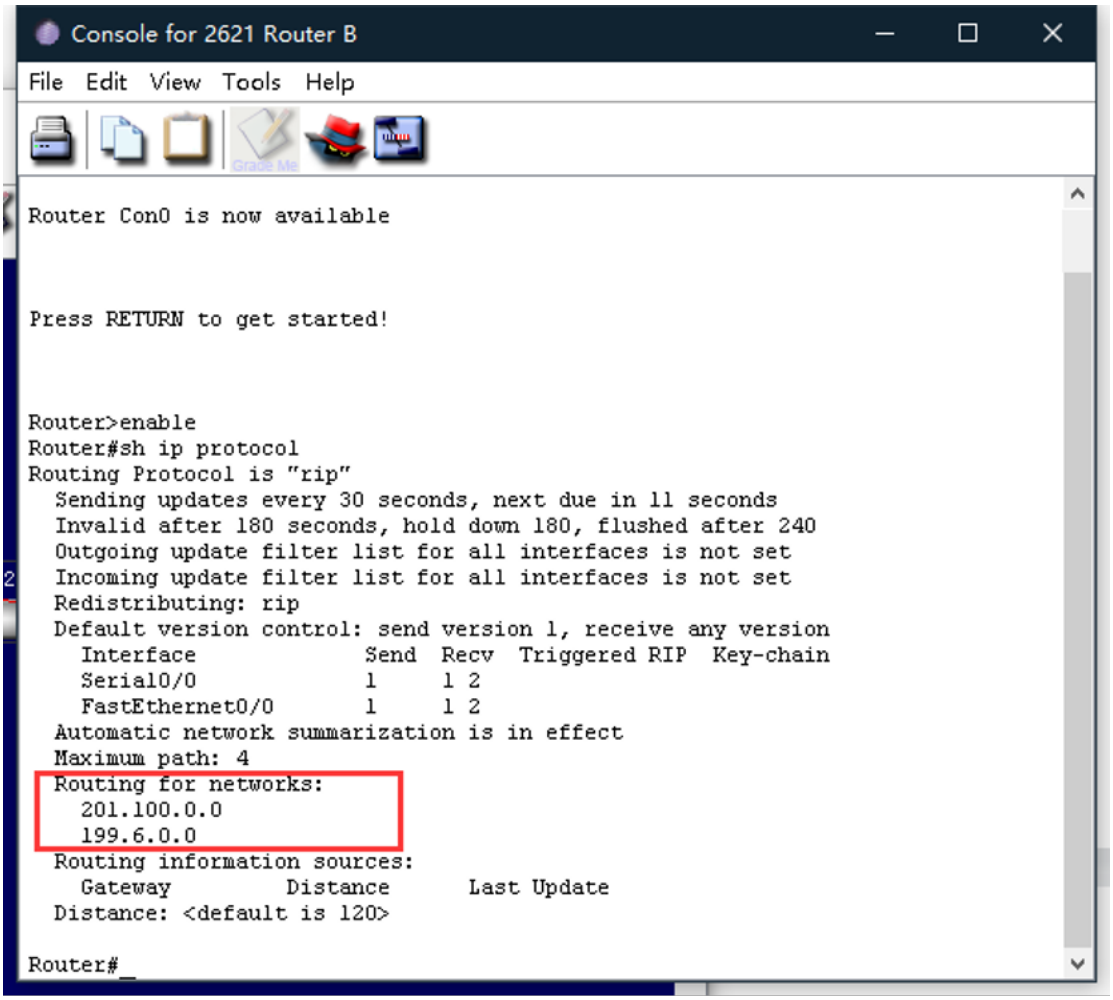




三，动态路由配置

如图：

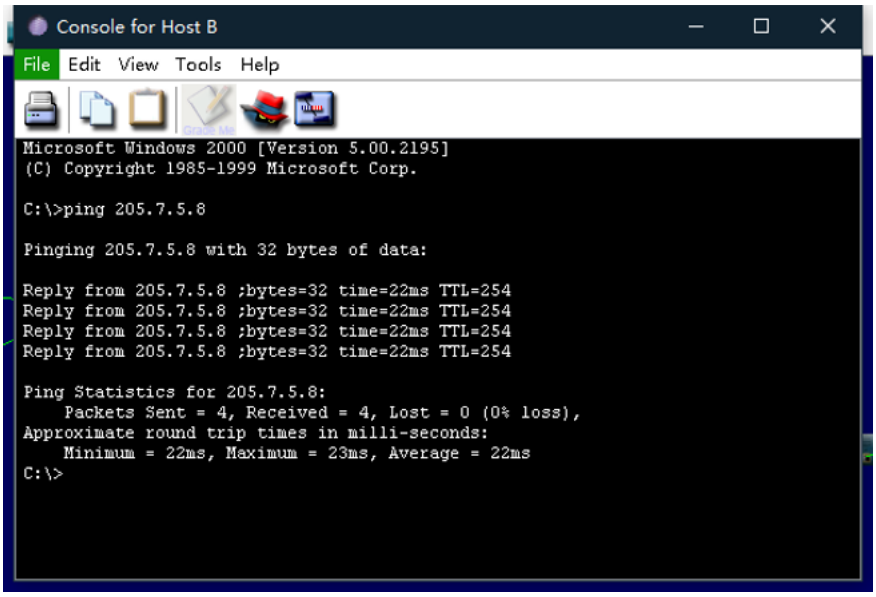

Console for 2621 Router A
File Edit View Tools Help
Router Con0 is now available
Press RETURN to get started!
Router>enable
Router#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 8 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update 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
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:
192.5.0.0
201.100.0.0
205.7.0.0
Routing information sources:
Gateway Distance Last Update
Distance: <default is 120>
Router#



四，配置访问列表

如图：

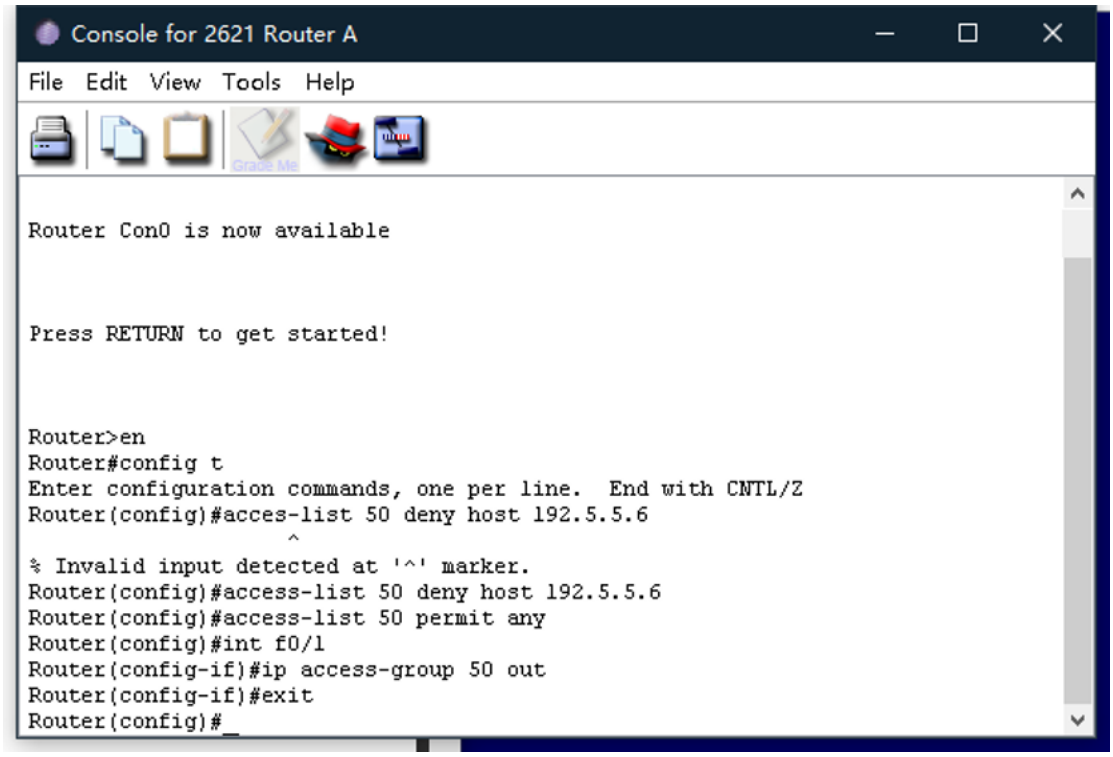
配置前连通性访问检测：
由主机 B（192.5.5.6） ping 主机 A 205.7.5.8



建立列表访问配置

命令： access-list [listnumber] [permit|deny] [source address] [wildcard mask]

设置 host192.5.5.6 拒绝访问



4 实验代码

本次实验的代码已上传于以下代码仓库：本次实验的代码已上传于以下代码仓库：代码放置于 Github，地址如下:

Github：https://github.com/Haruki9/Computer-Network_Labs/tree/main

Gitee：https://gitee.com/haruki9/computer-network_-labs）

5 实验总结

通过模拟器实践了解了路由器的配置实现，加深了在网络层的理解和体会，知道 IP 地址在路由中如何进行转发，了解了路由协议如 RIP，令牌环等的工作原理和方式，提高了自身的综合专业素养。