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 3 班

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2020 年 4 月 12 日

1 实验目的

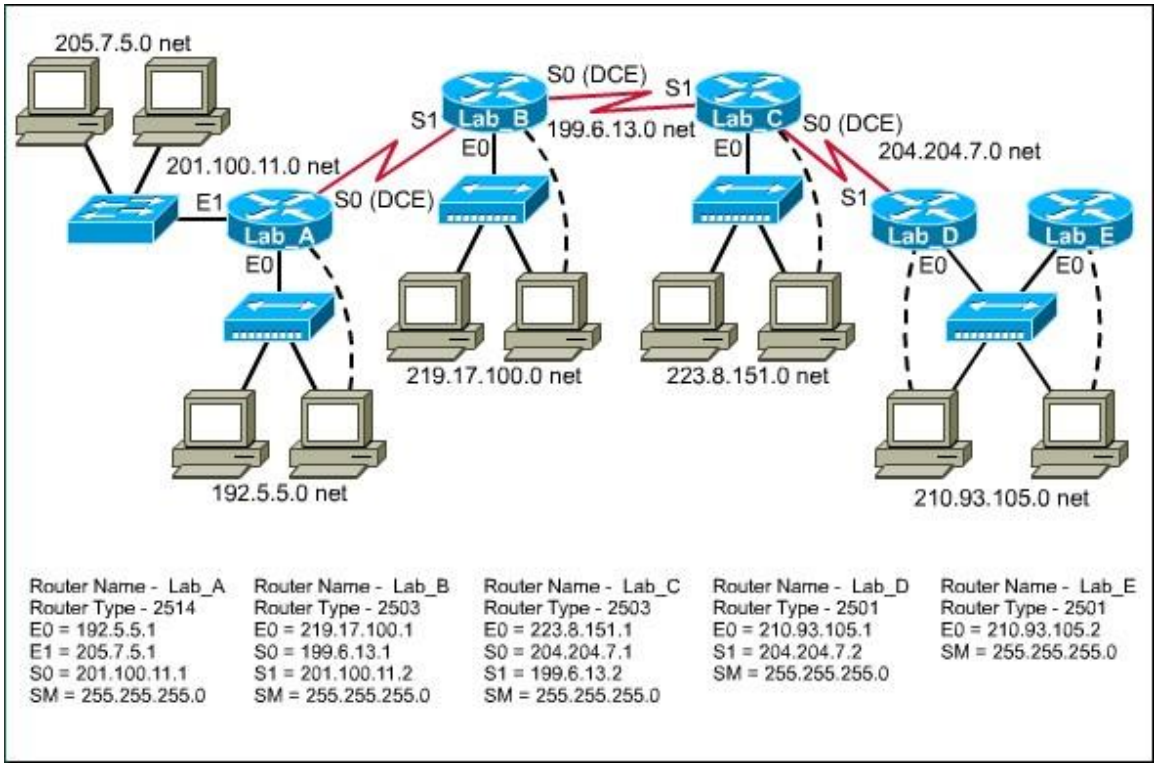
使用 Router eSIM v1.1 模拟器来模拟路由器的配置环境；使用 CCNA Network Visualizer 6.0 配置静态路由、动态路由和交换机端口的 VLAN（虚拟局域网）。

2 实验环境

Windows 10，Router eSIM v1.1，CCNA Network Visualizer 6.0

3 实验结果

网络拓扑结构



设置路由器名称

```
Router#config
Configuring from terminal, memory, or network [terminal]? terminal
Enter configuration commands, one per line.  End with END.
Router(config)#hostname Lab_A
```

配置路由器接口

```
Lab_A(config-if)#interface ethernet 0
Lab_A(config-if)#ip address 192.5.5.1 255.255.255.0
Lab_A(config-if)#interface ethernet 1
Lab_A(config-if)#ip address 205.7.5.1 255.255.255.0
Lab_A(config-if)#interface serial 0
Lab_A(config-if)#ip address 201.100.11.1 255.255.255.0
```

打开路由器接口

```
Lab_A#config terminal
Enter configuration commands, one per line.  End with END.
Lab_A(config)#interface serial 0
Lab_A(config-if)#no shutdown
Lab_A(config-if)#interface ethernet 0
Lab_A(config-if)#no shutdown
Lab_A(config-if)#interface ethernet 1
Lab_A(config-if)#no shutdown
Lab_A(config-if)#_
```

设置串口的时钟频率

```
Lab_A(config-if)#interface serial 0
Lab_A(config-if)#clock rate 56000
```

配置 RIP 协议

```
Lab_A(config)#router rip
Lab_A(config-router)#network 201.100.11.0
Lab_A(config-router)#network 205.7.5.0
Lab_A(config-router)#network 192.5.5.0
Lab_A(config-router)#_
```

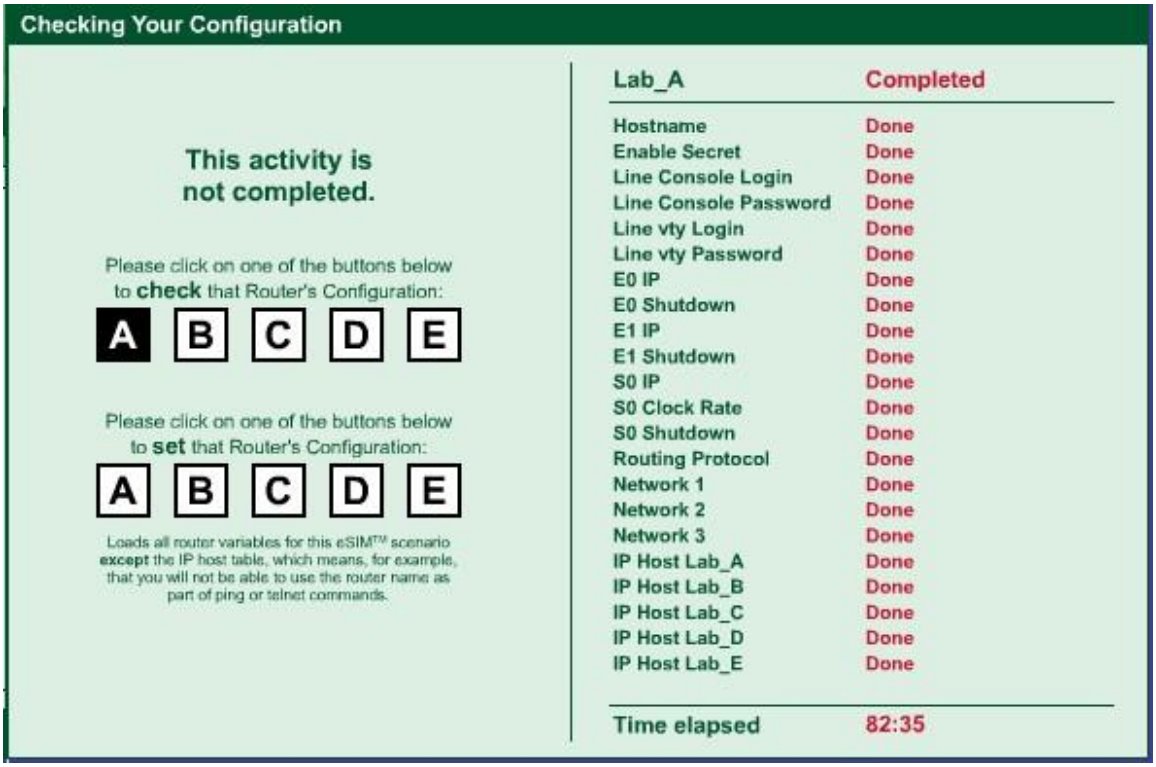
建立 IP 地址映射

```
Lab_B(config)#ip host Lab_A 192.5.5.1 205.7.5.1 201.100.11.1
Lab_B(config)#ip host Lab_B 219.17.100.1 199.6.13.1 201.100.11.2
Lab_B(config)#ip host Lab_C 223.8.151.1 204.204.7.1 199.6.13.2
Lab_B(config)#ip host Lab_D 210.93.105.1 204.204.7.2
Lab_B(config)#ip host Lab_E 210.93.105.2
```

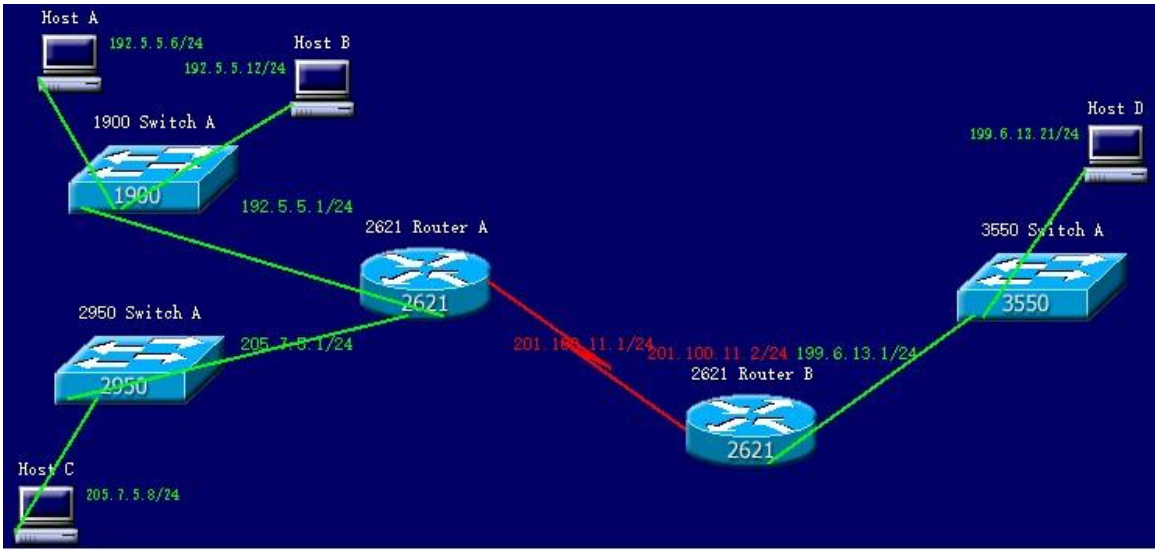
设置密码

```
Router(config)#enable secret class
Router(config)#line console 0
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#line vty 0 4
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#_
```

完成情况



CCNA Network Visualizer 6.0 配置路由的网络拓扑



连通性测试（Ping）

```
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 = 4/4/4 ms
Router#ping 205.7.5.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 205.7.5.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms
Router#
```

```
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
```

配置 RIP 协议

```
Router#show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 17 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       00:00:13
  Distance: <default is 120>

Router#
```

```
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 2 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
    205.7.5.0
    201.100.11.0
  Routing information sources:
    Gateway         Distance      Last Update
    201.100.11.2          120       00:00:28
  Distance: <default is 120>
```

配置标准访问列表以及它的效果

```
Router(config)#access-list 1 deny host 192.5.5.6
Router(config)#access-list 1 permit any
Router(config)#int f0/1
Router(config-if)#ip access 1 out
Router(config-if)#exit
Router(config)#
```

```
Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright 1985-1999 Microsoft Corp.

C:\>ping 205.7.5.8

Pinging 205.7.5.8 with 32 bytes of data:

Reply from 205.7.5.8 ;bytes=32 time=22ms TTL=254
Reply from 205.7.5.8 ;bytes=32 time=22ms TTL=254
Reply from 205.7.5.8 ;bytes=32 time=22ms TTL=254
Reply from 205.7.5.8 ;bytes=32 time=22ms TTL=254

Ping Statistics for 205.7.5.8:
    Packets Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 22ms, Maximum = 23ms, Average = 22ms
C:\>ping 205.7.5.8

Pinging 205.7.5.8 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping Statistics for 205.7.5.8:
    Packets Sent = 4, Received = 0, Lost = 4 (100% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

配置动态访问列表并阻止某 IP 登陆路由器

```
Router(config)#access-list 1 deny 192.5.5.0 255.255.255.0
Router(config)#access-list 1 permit any
Router(config)#int s0/0
Router(config-if)#ip access-group 1 out
Router(config-if)#exit
```

```
Connection to host lost.
C:\>telnet
Host: 201.100.11.2
Connecting To 201.100.11.2 ...Could not open a connection to host: Connect faile

C:\>
```

```
C:\>telnet
Host: 201.100.11.2
Connecting To 201.100.11.2 ...

User Access Verification

Password:

Router>
```

CCNA Network Visualizer 6.0 配置 VLAN

设置 VTP 域

```
switch>enable
switch#config
Enter configuration commands, one per line.  End with CNTL/Z
switch(config)#vtp domain Cisco
Changing VTP domain name from NULL to Cisco
switch(config)#exit
switch#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                 : 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 Vl1 (lowest numbered VLAN interface
found)
switch#
```

配置 trunk

```
switch(config-if)#int f0/2
switch(config-if)#switchport trunk encapsulation dot1q
11:49:50: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, chang
to down
11:49:50: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, chang
switch(config-if)#switchport mode trunk
switch(config-if)#
```

创建 VLAN

```
switch>config
Translating "config"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address
switch>enable
switch#config
Enter configuration commands, one per line.  End with CNTL/Z
switch(config)#vlan 10
switch(config-vlan)#vlan 20
switch(config-vlan)#exit
switch(config)#exit
switch#show vlan

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/3, 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

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


Primary Secondary Type              Ports
------- --------- ----------------- ------------------------------------------


switch#
switch#
```

分配交换机接口

```
Enter configuration commands, one per line.  End with CNTL/Z
switch(config)#int f0/1
switch(config-if)#switchport access vlan 20
switch(config-if)#
```

配置第三层交换机

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

VALN 创建成功

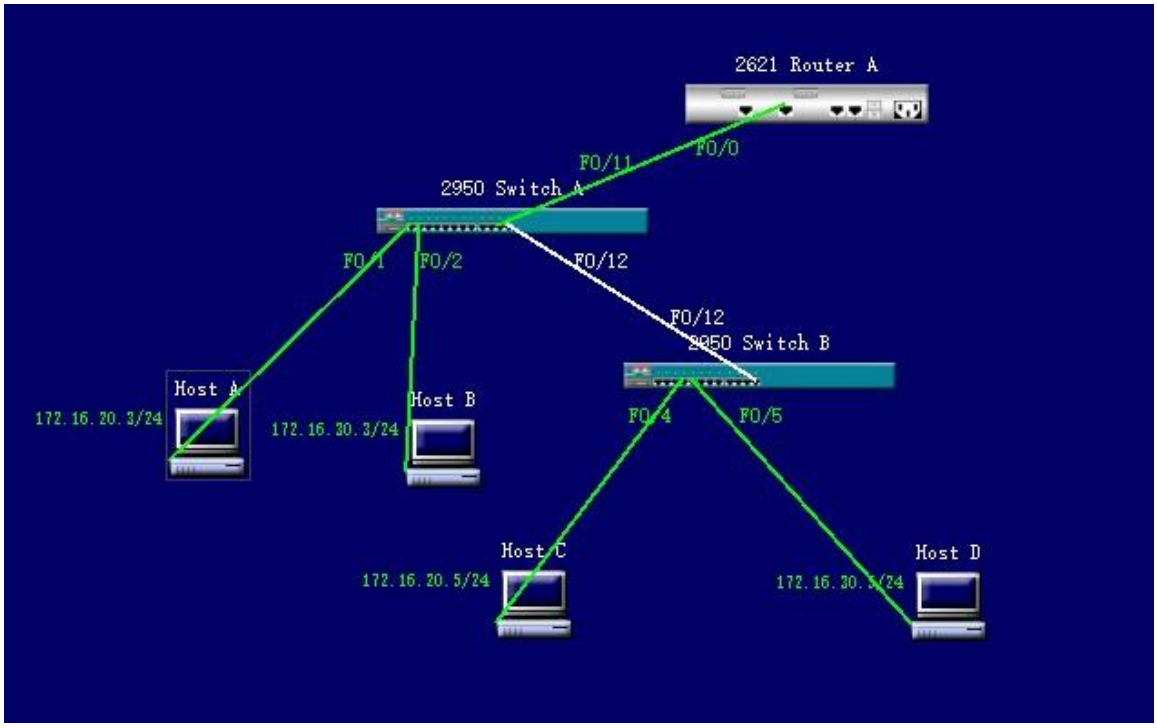
```
C:\>ping 20.20.20.2

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
C:\>
```

网络拓扑



4 实验总结

路由器拥有登陆密码和特权密码，两者可以不同。

如何解决网络不通（注意，该设备应拥有 IP）：

1. Ping 回环地址 127.0.0.1，不知为何，在模拟器上无效。
2. Ping 本机 IP→检查本机问题，例如 IP 地址与其他主机冲突，DHCP 协议错误等
3. Ping 局域网内 IP→本局域网内链路问题
4. Ping 其他网络网关 IP→路由器问题，例如路由表设置错误
5. 一直 Ping 到目标主机→一步步解决问题

ICMP 协议的错误设置会导致网络 Ping 不通。
有些交换机可以工作在第三层，具备路由功能。