

廈門大學



信息学院软件工程系

《计算机网络》实验报告

题 目 实验五 CISCO IOS 路由器基本配置

班 级 软件工程 2018 级 1 班

姓 名 刘久一

学 号 24320182203235

实验时间 2020 年 4 月 8 日

2020 年 4 月 8 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

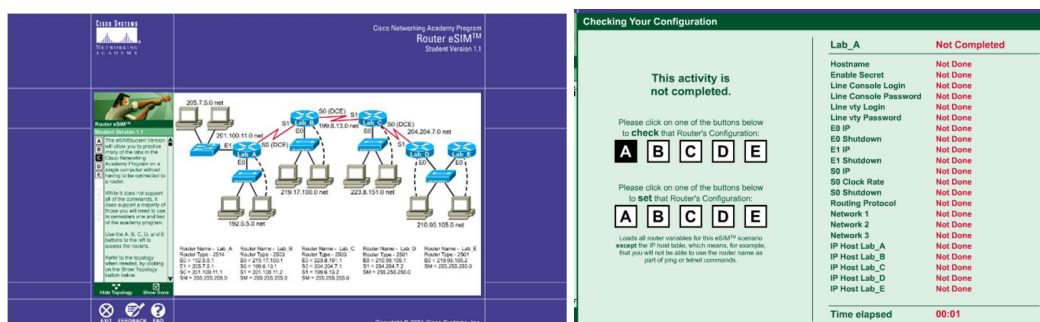
Windows 10

Router eSIM v1.1

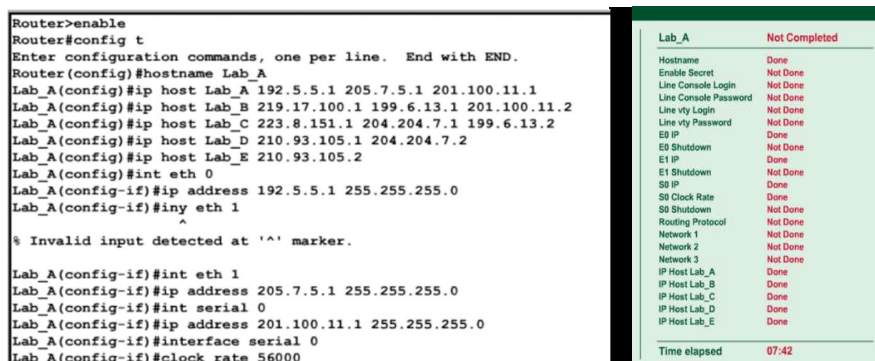
CCNA Network Visualizer 6.0

3 实验结果

1.利用 Router eSIM v1.1 练习配置虚拟路由器：



进入软件界面，可以察看路由表和 todo-list。

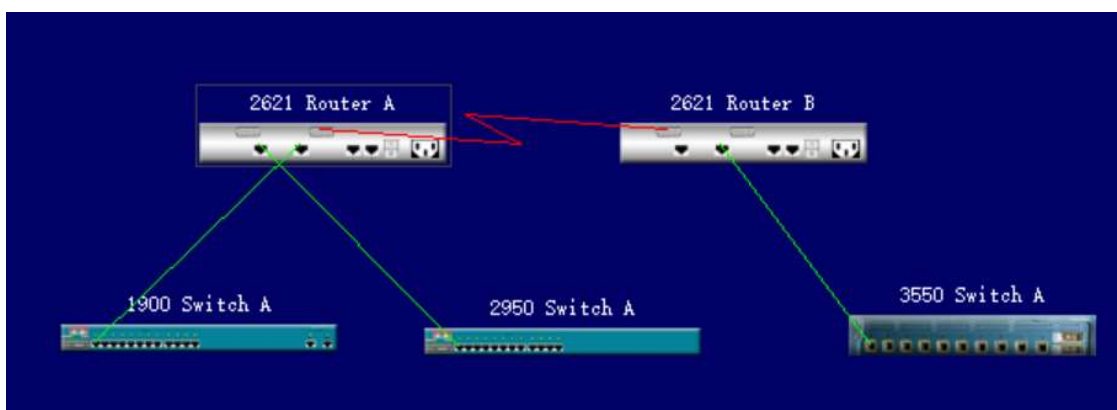


下面开始配置路由器的信息，这里配置五个路由器的 host IP 地址,接口 E0,E1 的 IP 地址以及 S0 的 IP 地址，时钟同步率；

```
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 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
```

察看路由器状态，证明设置有效，完成配置。

2. 使用 CCNA Network Visualizer 6.0 配置静态路由



首先进行路由连线；

```

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
13:41:52 %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
13:41:52 %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#int f0/1
Router(config-if)#ip address 205.7.5.1 255.255.255.0
Router(config-if)#no shutdown
13:43:24 %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
13:43:24 %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 5600
% Invalid input detected at '^' marker.
Router(config-if)#no shutdown
13:44:11 %LINK-3-UPDOWN: Interface Serial0/0, changed state to up
13:44:11 %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to up

Router(config-if)#exit
Router(config)#exit
Router#

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z
Router(config)#int s0/1
Router(config-if)#ip addr 201.100.11.2 255.255.255.0
Router(config-if)#clock rate 5600
% Invalid input detected at '^' marker.
Router(config-if)#no shutdown
14:01:44 %LINK-3-UPDOWN: Interface Serial0/1, changed state to up
14:01:44 %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1, changed state to up

Router(config-if)#int f0/0
Router(config-if)#ip addr 199.6.13.1 255.255.255.0
Router(config-if)#no shutdown
14:02:38 %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
14:02:38 %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#exit
Router#

```

配置好路由器端口的 ip 地址信息:

```

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
-----
C      199.6.13.0/24 is directly connected, FastEthernet0/0
C      201.100.11.0/24 is directly connected, Serial0/1

```

端口已经配置好.

```

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

```

下面配置静态路由: 设置 A 路由器通往 199.6.13.* 的下一跳为 201.100.11.2

```

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

```

ping 命令成功, 证明路由器静态路由配置成功.

3.使用 CCNA Network Visualizer 6.0 配置动态路由

先如图所示连接路由器。



配置 rip:

```

Router(config-if)#exit
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)#show ip protocols
Router(config)#^
% Invalid input detected at '^' marker.
Router(config)#exit
Router#show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 29 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
  Automatic network summarization is in effect
  Maximum path: 4
  Routing for networks:
    10.0.0.0
    172.16.0.0
  Routing information sources:
    Gateway            Distance      Last Update
  Distance: <default is 120>

```

其余路由器均按此方法配置。

```

Gateway of last resort is not set

  172.16.0.0/24 is subnetted, 1 subnets
R    172.16.1.0 [120/2] via 10.2.2.2, 00:00:17, Serial0/1
  10.0.0.0/24 is subnetted, 2 subnets
R    10.1.1.0 [120/1] via 10.2.2.2, 00:00:17, Serial0/1
C    10.2.2.0 is directly connected, Serial0/1
C    192.168.1.0/24 is directly connected, FastEthernet0/1

```

在成功配置好之后，动态路由会自动寻址：

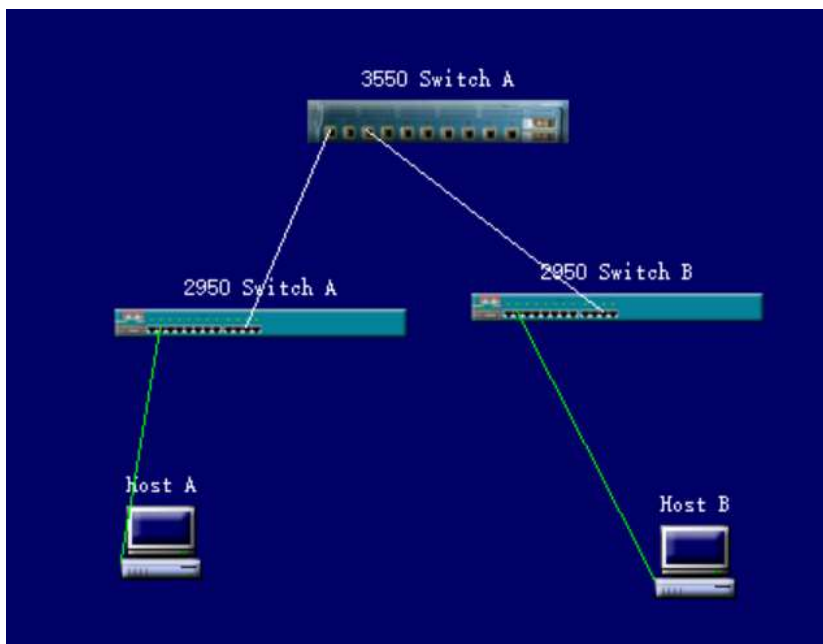
```
Router#ping 172.16.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms
```

动态路由配置成功。

4.使用 CCNA Network Visualizer 6.0 配置交换机端口的 VLAN（虚拟局域网）

下面进行实验的第一部分：

首先连接路由器和交换机：



```
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)
```

将两台交换机设置为 client 端.

```
3550A(config-if)#switchport trunk encapsulation dot1q
02:11:34: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state
to down
02:11:34: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
3550A(config-if)#switchport mode trunk
3550A(config-if)#int f0/3
3550A(config-if)#switchport trunk encapsulation dot1q
02:12:31: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state
to down
02:12:31: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to up
3550A(config-if)#switchport mode trunk
3550A(config-if)#
```

修改端口为 Trunk 端口.

```
2950A(config)#int f0/2
2950A(config-if)#switchport access vlan 10
```

建立 vlan 并将两交换机接口接入 vlan;


```
3550A>enable
3550A#config t
Enter configuration commands, one per line. End with CNTL/Z
3550A(config)#int vlan 10
3550A(config-if)#ip addr 10.10.10.1 255.255.255.0
3550A(config-if)#no shut
3550A(config-if)#int vlan 20
3550A(config-if)#ip addr
% Incomplete command.
3550A(config-if)#ip addr 20.20.20.1 255.255.255.0
3550A(config-if)#no shut
3550A(config-if)#exit
3550A(config)#ip routing
3550A(config)#int vlan 1
3550A(config-if)#ip addr 192.168.10.1 255.255.255.0
3550A(config-if)#no shut
```

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

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

配置第三层交换机

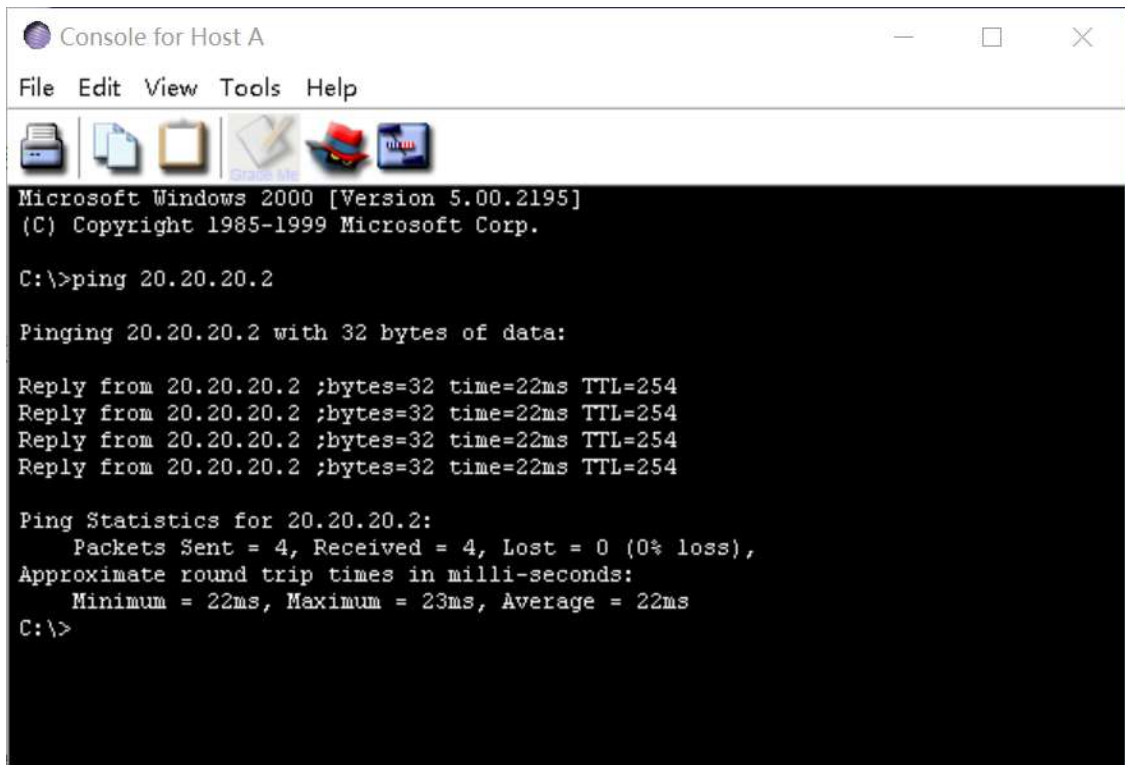
```
3550A>enable
3550A#ping 192.168.10.2

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
```

成功 ping，代表 vlan 网络配置成功。

Configure Host A	Configure Host B
Host Name: <input type="text" value="hostA"/>	Host Name: <input type="text" value="hostB"/>
<input type="radio"/> Obtain an IP address automatically	<input type="radio"/> Obtain an IP address automatically
<input checked="" type="radio"/> Use the following IP address:	<input checked="" type="radio"/> Use the following IP address:
IP Address <input type="text" value="10"/> <input type="text" value="10"/> <input type="text" value="10"/> <input type="text" value="2"/>	IP Address <input type="text" value="20"/> <input type="text" value="20"/> <input type="text" value="20"/> <input type="text" value="2"/>
Subnet <input type="text" value="255"/> <input type="text" value="255"/> <input type="text" value="255"/> <input type="text" value="0"/>	Subnet <input type="text" value="255"/> <input type="text" value="255"/> <input type="text" value="255"/> <input type="text" value="0"/>
Default Gateway <input type="text" value="10"/> <input type="text" value="10"/> <input type="text" value="10"/> <input type="text" value="1"/>	Default Gateway <input type="text" value="20"/> <input type="text" value="20"/> <input type="text" value="20"/> <input type="text" value="1"/>
<input type="button" value="OK"/> <input type="button" value="Cancel"/>	<input type="button" value="OK"/> <input type="button" value="Cancel"/>

配置主机 ip 信息:



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

C:\>ping 20.20.20.2

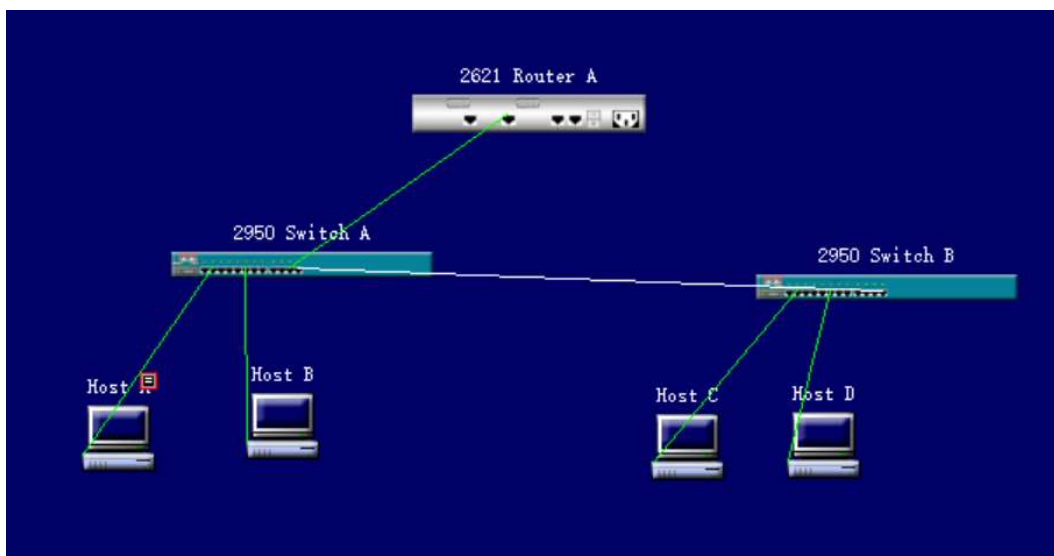
Pinging 20.20.20.2 with 32 bytes of data:

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:\>
```

ping 成功。

下面进行该实验的第二部分:



连接线路。

```
switch(config)#hostname 2950A
2950A(config)#vtp domain test
^
% Invalid input detected at '^' marker.
2950A(config)#vtp domain test
Changing VTP domain name from NULL to test
2950A(config)#vtp mode server
Device mode already VTP SERVER.
```

配置 VTP

```
switch>en
switch#conf t
Enter configuration commands, one per line. End with CNTL/Z
switch(config)#hostname 2950B
2950B(config)#int f0/12
2950B(config-if)#switchport mode trunk
2950B(config-if)#exit
2950B(config)#
```

启动 trunk

```
2950A>en
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
-----
```

创建 vlan

```
% Invalid input detected at '^' marker.
2950A(config)#int fastethernet 0/2
2950A(config-if)#switchport access vlan 2
2950A(config-if)#switchport mode access
2950A(config-if)#int fastethernet 0/6
2950A(config-if)#switchport access vlan 3
2950A(config-if)#switchport mode access
```

```
-----
2950B(config)#int fastethernet 0/2
2950B(config-if)#switchport access vlan 2
2950B(config-if)#switchport mode access
2950B(config-if)#interface fastethernet 0/6
2950B(config-if)#switchport access vlan 3
2950B(config-if)#switchport mode access
-----
```

将端口

加入 vlan

```

% Invalid input detected at '^' marker.
R2600(config-if)#int fastethernet 0/0.1
R2600(config-subif)#encapsulation dot1q 1
R2600(config-subif)#ip addr 172.16.10.1 255.255.255.0
R2600(config-subif)#int fastethernet 0/0.2
R2600(config-subif)#ip addr 172.16.20.1 255.255.255.0
R2600(config-subif)#encapsulation dot1q 1
R2600(config-subif)#int fastethernet 0/0.3
R2600(config-subif)#encapsulation dot1q 3
R2600(config-subif)#encapsulation dot1q 2
R2600(config-subif)#int fastethernet 0/0.3
R2600(config-subif)#ip addr 172.16.30.1 255.255.255.0
R2600(config-subif)#encapsulation dot1q 3

```

配置 vlan 之间的路由

Configure Host A

Host Name:

☐ Obtain an IP address automatically

☒ Use the following IP address:

IP Address

Subnet

Default Gateway

配置 host 的 ip 信息

```

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

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

```

```

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

```

成功 ping，代表 vlan 设置成功。

4 实验总结

这次实验主要是模拟配置路由器。其中配置路由器的许多知识是我之前不了解的，我参考了许多课外资料，实验才得以成功进行。同时我也对静态，动态(特别是 rip)路由,vlan 这三种实现 host 连接的方式有了进一步的理解。