实验 1：网络设备仿真配置

学号：71118321
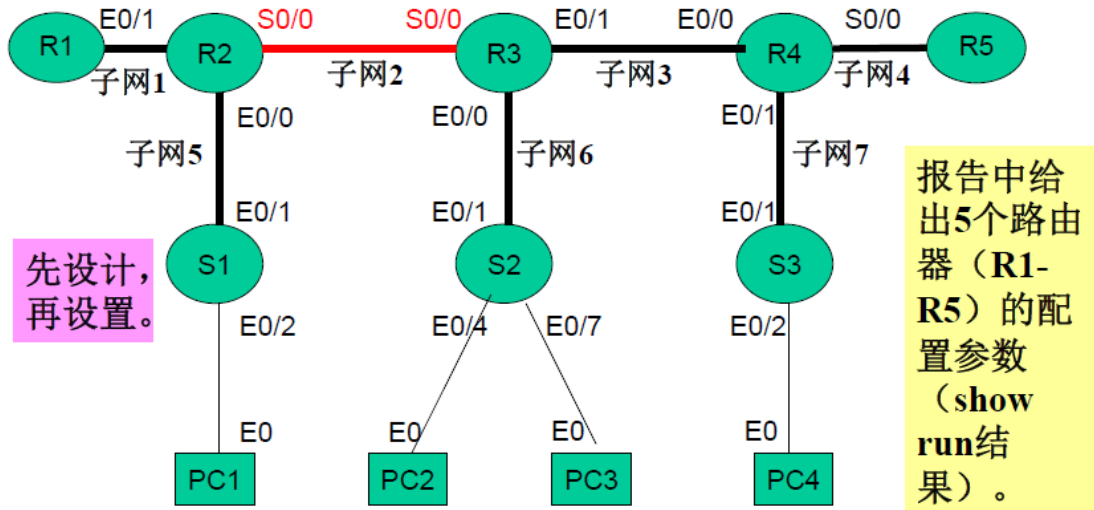
姓名：周嘉莹

报告日期：2019.2.10

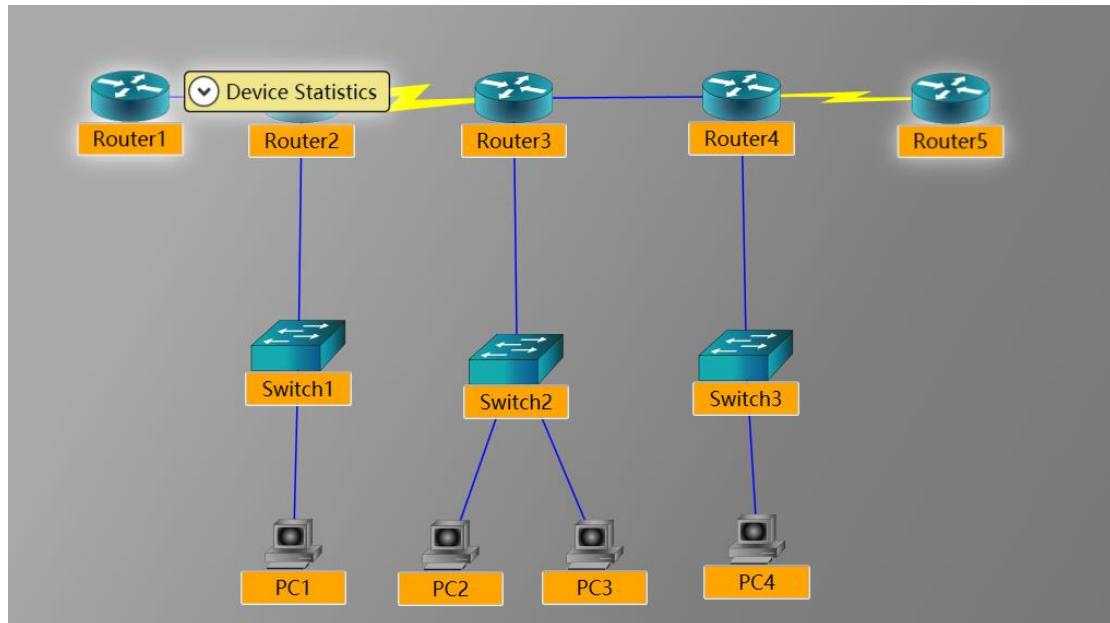# 一、设计目标

设计如图的网络，并进行 IP 地址和路由表的配置

期望的结果：路由器的每个端口对应一个子网；要求的子网地址为：**xx.yy.zz.0—xx.yy.zz+6.0**（假设同学学号为 **71xxyyzz**），终端及其设备端口分配 **IP** 地址，并保证连通（**Ping**）
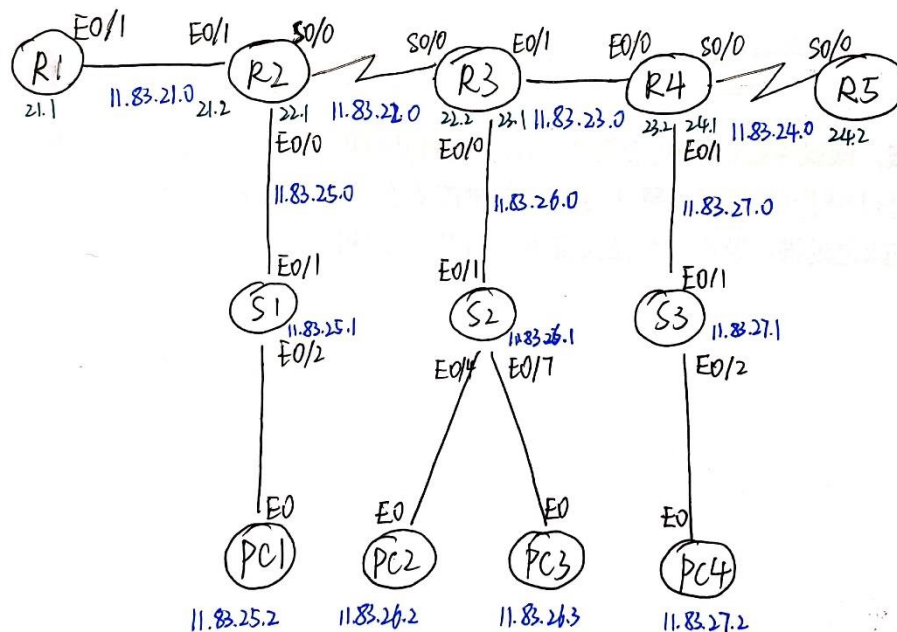

二、设计过程

1.分析网络图知，该网络由该网络由 5 个路由器 R1,R2,R3,R4,R5、3 个交换机 S1,S2,S3、4 个终端 PC1,PC2,PC3,PC4 以及他们之间的连线构成，其中 R2 和 R3、R4 和 R5 之间采用串口线连接，其余组件通过以太网线连接。
2.根据以上分析，在 Netsim 上设计出连接图

3.我的学号为 71118321，我的七个子网的地址为 11.83.21.0~11.83.21+6.0，得到各个组件之间端口和子网地址的详细设计图

4.根据设计图进行路由器和终端配置

<1>.路由器的配置

（1）端口的设置

 R2 S0/0 和 R4 S0/0 为 **DCE** 串型接口，需设置时钟频率

Router1：

Devices: Router1 [Device #1]

```
Press Enter to Start

Router>enable
Router#con t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int E 0/1
Router(config-if)#ip addr 11.83.21.1 255.255.255.0
Router(config-if)#no sh
%LINK-3-UPDOWN: Interface Ethernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/1, changed state to up
%LINK-3-UPDOWN: Interface Ethernet0/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/1, changed state to down
Router(config-if)#exit
Router(config)#exit
Router#
```

Router2：

```
Router#con t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int E 0/1
Router(config-if)#ip address 11.83.21.2 255.255.255.0
Router(config-if)#no shutdowm
                        ^
% Invalid input detected at '^' marker.

Router(config-if)#no shutdowm
                        ^
% Invalid input detected at '^' marker.

Router(config-if)#no sh
%LINK-3-UPDOWN: Interface Ethernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/1, changed state to up
Router(config-if)#
```

```
Router(config)#int E 0/0
Router(config-if)#ip address 11.83.25.1 255.255.255.0
Router(config-if)#no sh
%LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to up
```

```
Router(config-if)#clock rate 2000000
```

```
Router(config)#int s 0/0
Router(config-if)#ip address 11.83.22.1 255.255.255.0
Router(config-if)#no sh
%LINK-3-UPDOWN: Interface Serial0/0, changed state to up
```

Router3：

Devices: Router3 [Device #3]

```
Press Enter to Start

Router>enable
Router#con t
Enter configuration commands, one per line.  End with CNTL/Z.
```
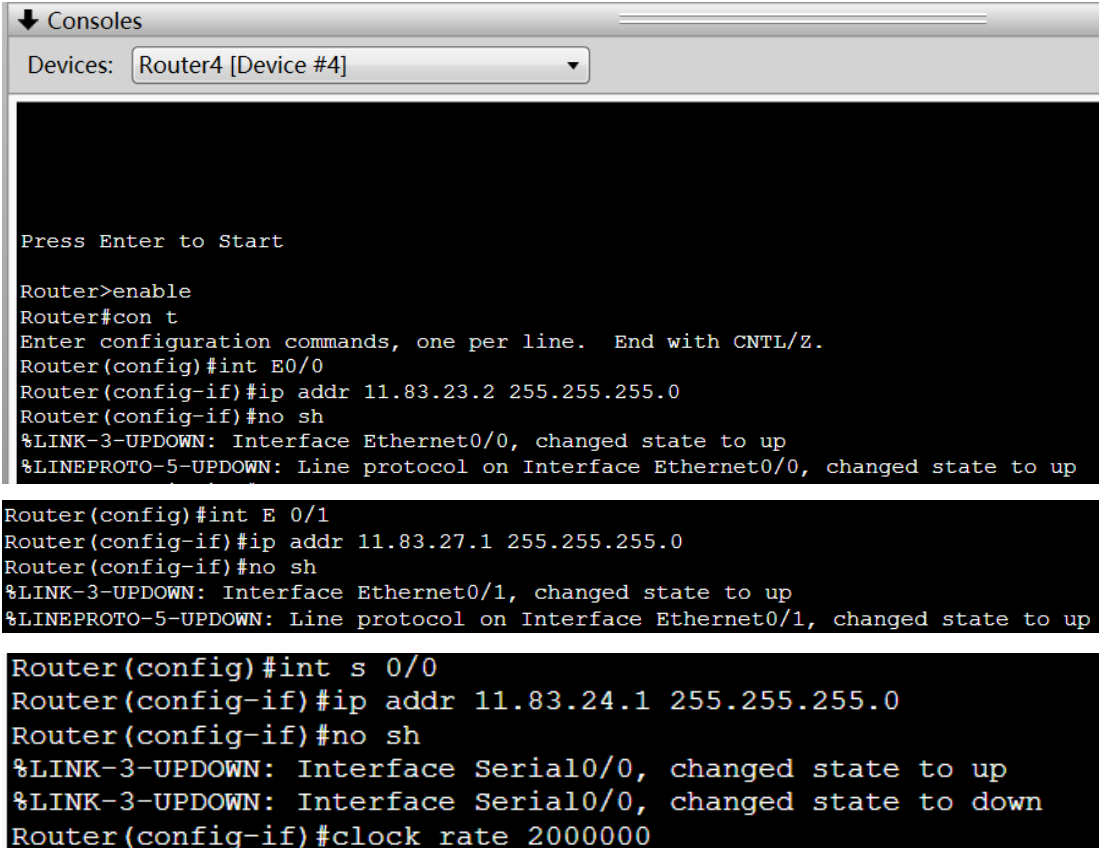
```
Router(config)#int E 0/0
Router(config-if)#ip addr 11.83.26.1 255.255.255.0
Router(config-if)#no sh
Router(config-if)#exit
Router(config)#int E 0/1
Router(config-if)#ip addr 11.83.23.1 255.255.255.0
Router(config-if)#no sh
%LINK-3-UPDOWN: Interface Ethernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/1, changed state to up
```

```
Router(config)#int s 0/0
Router(config-if)#ip addr 11.83.22.2
                                ^
% Invalid input detected at '^' marker.

Router(config-if)#ip addr 11.83.22.2 255.255.255.0
Router(config-if)#no sh
%LINK-3-UPDOWN: Interface Serial0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to up
```

Router4：

```
↓ Consoles
Devices:  Router4 [Device #4]                      ▼




Press Enter to Start

Router>enable
Router#con t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int E0/0
Router(config-if)#ip addr 11.83.23.2 255.255.255.0
Router(config-if)#no sh
%LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to up
```

```
Router(config)#int E 0/1
Router(config-if)#ip addr 11.83.27.1 255.255.255.0
Router(config-if)#no sh
%LINK-3-UPDOWN: Interface Ethernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/1, changed state to up
```

```
Router(config)#int s 0/0
Router(config-if)#ip addr 11.83.24.1 255.255.255.0
Router(config-if)#no sh
%LINK-3-UPDOWN: Interface Serial0/0, changed state to up
%LINK-3-UPDOWN: Interface Serial0/0, changed state to down
Router(config-if)#clock rate 2000000
```

Router5：

```
Press Enter to Start

Router>enable
Router#con t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int s 0/0
Router(config-if)#ip addr 11.83.24.2 255.255.255.0
Router(config-if)#no sh
%LINK-3-UPDOWN: Interface Serial0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to up
```

（2）静态路由表的设置

Router1：

以 R1 为例，于 R1 相连的子网为子网 1，所以需要配置静态路由表的是子网 2，3，4，5，6，7。同理可得其他路由表

```
Router(config)#IP route 11.83.22.0 255.255.255.0 11.83.21.2
Router(config)#IP route 11.83.23.0 255.255.255.0 11.83.21.2
Router(config)#IP route 11.83.24.0 255.255.255.0 11.83.21.2
Router(config)#IP route 11.83.25.0 255.255.255.0 11.83.21.2
Router(config)#IP route 11.83.26.0 255.255.255.0 11.83.21.2
Router(config)#IP route 11.83.27.0 255.255.255.0 11.83.21.2
```

Router2：

```
Router(config)#IP route 11.83.23.0 255.255.255.0 11.83.22.2
Router(config)#IP route 11.83.24.0 255.255.255.0 11.83.22.2
Router(config)#IP route 11.83.26.0 255.255.255.0 11.83.22.2
Router(config)#IP route 11.83.27.0 255.255.255.0 11.83.22.2
```

Router3：

```
Router(config)#IP route 11.83.21.0 255.255.255.0 11.83.22.1
Router(config)#IP route 11.83.24.0 255.255.255.0 11.83.23.2
Router(config)#IP route 11.83.25.0 255.255.255.0 11.83.22.1
Router(config)#IP route 11.83.27.0 255.255.255.0 11.83.23.2
```

Router4：

```
Router(config)#IP route 11.83.21.0 255.255.255.0 11.83.23.1
Router(config)#IP route 11.83.22.0 255.255.255.0
Router(config)#IP route 11.83.22.0 255.255.255.0 11.83.23.1
Router(config)#IP route 11.83.25.0 255.255.255.0 11.83.23.1
Router(config)#IP route 11.83.26.0 255.255.255.0 11.83.23.1
```

Router5：

```
Router(config)#IP route 11.83.21.0 255.255.255.0 11.83.24.1
Router(config)#IP route 11.83.22.0 255.255.255.0 11.83.24.1
Router(config)#IP route 11.83.23.0 255.255.255.0 11.83.24.1
Router(config)#IP route 11.83.25.0 255.255.255.0 11.83.24.1
Router(config)#IP route 11.83.26.0 255.255.255.0 11.83.24.1
Router(config)#IP route 11.83.27.0 255.255.255.0 11.83.24.1
```

<2>终端的设置

PC1：

```
C:>IPconfig /ip 11.83.25.2 255.255.255.0
C:>IPconfig /dg 11.83.25.1
```

PC2：

```
C:>IPconfig /ip 11.83.26.2 255.255.255.0
C:>IPconfig .dg 11.83.26.1
             ^
% Invalid input detected at '^' marker.

C:>Ipconfig /dg 11.83.26.1
```

PC3：

```
C:>IPconfig /ip 11.83.26.3 255.255.255.0
C:>IPconfig /dg 11.83.26.0
C:>IPconfig /dg 11.83.26.1
```

PC4：

```
C:>IPconfig /ip 11.83.27.2 255.255.255.0
C:>IPconfig /dg 11.83.27.1\
C:>IPconfig /dg 11.83.27.1
```

三、实验结果

1.路由器参数配置

Router1：

```
interface Ethernet0/1
 ip address 11.83.21.1 255.255.255.0
```

```
ip classless
no ip http server
!
ip route 11.83.22.0 255.255.255.0 11.83.21.2
ip route 11.83.23.0 255.255.255.0 11.83.21.2
ip route 11.83.24.0 255.255.255.0 11.83.21.2
ip route 11.83.25.0 255.255.255.0 11.83.21.2
ip route 11.83.26.0 255.255.255.0 11.83.21.2
ip route 11.83.27.0 255.255.255.0 11.83.21.2
```

Router2：

```
interface Serial0/0
 ip address 11.83.22.1 255.255.255.0
 no ip directed-broadcast
 clock rate 2000000
!
interface Ethernet0/0
 ip address 11.83.25.1 255.255.255.0
 no ip directed-broadcast
!
interface Ethernet0/1
 ip address 11.83.21.2 255.255.255.0
 no ip directed-broadcast
```

```
ip classless
no ip http server
!
ip route 11.83.23.0 255.255.255.0 11.83.22.2
ip route 11.83.24.0 255.255.255.0 11.83.22.2
ip route 11.83.26.0 255.255.255.0 11.83.22.2
ip route 11.83.27.0 255.255.255.0 11.83.22.2
```

Router3：

```
interface Serial0/0
 ip address 11.83.22.2 255.255.255.0
 no ip directed-broadcast
!
interface Ethernet0/0
 ip address 11.83.26.1 255.255.255.0
 no ip directed-broadcast
!
interface Ethernet0/1
 ip address 11.83.23.1 255.255.255.0
 no ip directed-broadcast
```

```
ip classless
no ip http server
!
ip route 11.83.21.0 255.255.255.0 11.83.22.1
ip route 11.83.24.0 255.255.255.0 11.83.23.2
ip route 11.83.25.0 255.255.255.0 11.83.22.1
ip route 11.83.27.0 255.255.255.0 11.83.23.2
```

Router4：

```
interface Serial0/0
 ip address 11.83.24.1 255.255.255.0
 no ip directed-broadcast
 clock rate 2000000
!
interface Ethernet0/0
 ip address 11.83.23.2 255.255.255.0
 no ip directed-broadcast
!
interface Ethernet0/1
 ip address 11.83.27.1 255.255.255.0
 no ip directed-broadcast
```

```
ip classless
no ip http server
!
ip route 11.83.21.0 255.255.255.0 11.83.23.1
ip route 11.83.22.0 255.255.255.0 11.83.23.1
ip route 11.83.25.0 255.255.255.0 11.83.23.1
ip route 11.83.26.0 255.255.255.0 11.83.23.1
```

Router5：

```
interface Serial0/0
 ip address 11.83.24.2 255.255.255.0
 no ip directed-broadcast
!
```

```
ip classless
no ip http server
!
ip route 11.83.21.0 255.255.255.0 11.83.24.1
ip route 11.83.22.0 255.255.255.0 11.83.24.1
ip route 11.83.23.0 255.255.255.0 11.83.24.1
ip route 11.83.25.0 255.255.255.0 11.83.24.1
ip route 11.83.26.0 255.255.255.0 11.83.24.1
ip route 11.83.27.0 255.255.255.0 11.83.24.1
```

2.ping 测试

（1）终端-路由器

PC2（11.83.26.2）-Router5（11.83.24.2）

Devices: PC2 [Device #10]

```
C:>Ipconfig /dg 11.83.26.1
C:>ping 11.83.24.2

Pinging 11.83.24.2 with 32 bytes of data:
Reply from 11.83.24.2: bytes=32 time=55ms TTL=241
Reply from 11.83.24.2: bytes=32 time=62ms TTL=241
Reply from 11.83.24.2: bytes=32 time=67ms TTL=241
Reply from 11.83.24.2: bytes=32 time=58ms TTL=241
Reply from 11.83.24.2: bytes=32 time=58ms TTL=241

Ping statistics for 11.83.24.2:
    Packets: Sent = 5, Received = 5, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 55ms, Maximum =  67ms, Average =  60ms

C:>
```

（2）路由器-路由器

Router2-Router4（11.83.23.2/11.83.24.1/11.83.27.1）

Devices: Router2 [Device #2]

```
no scheduler allocate
end

Router#ping 11.83.23.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 11.83.23.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
Router#ping 11.83.24.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 11.83.24.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
Router#
```

（3）终端-终端

PC1（11.83.25.2）-PC3（11.83.26.3）

Devices: PC1 [Device #9]

```
C:>ping 11.83.26.3

Pinging 11.83.26.3 with 32 bytes of data:
Reply from 11.83.26.3: bytes=32 time=48ms TTL=241
Reply from 11.83.26.3: bytes=32 time=71ms TTL=241
Reply from 11.83.26.3: bytes=32 time=65ms TTL=241
Reply from 11.83.26.3: bytes=32 time=50ms TTL=241
Reply from 11.83.26.3: bytes=32 time=70ms TTL=241

Ping statistics for 11.83.26.3:
    Packets: Sent = 5, Received = 5, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 48ms, Maximum =  71ms, Average =  61ms

C:>
```

四、实验小结

1. **Router#show run**，显示路由器的当前配置，查看所有配置信息需要按两次空格"show more"

2. **Router(config-if)#no shutdown**，开放端口，每个端口都要此操作

3. **Router(config-if)#clock rate 2000000** 对应串行口，双方分别作为DTE和DCE，DCE端口需设置时钟频率

4.小结：本次实验使我对网络拓扑结构有了更深的了解，通过自己动手配置网络，我明白了各个网络互连部件，尤其是路由器和网关的特点和使用方法。在实践过程也纠正了自己对计算机网络互连中一些概念的些许偏差，解决了自己在学习过程中遇到一些问题。本次实验对我来说，是一次弥足珍贵的实践机会。