《计算机网络》实验报告

信息 学院 智能科学与技术 专业 2020 级

实验时间 2022 年 11 月 7 日

姓名 学号

实验名称 路由器相关配置实验

实验成绩

一、实验目的

（一）实验 10 路由器的基本配置

了解路由器的作用

熟悉路由器的基本配置方法

熟悉 Packet Tracer 8.0 模拟软件的使用

（二）实验 11 静态路由实验

（三）实验 12 路由信息协议（RIP）实验

二、实验仪器设备及软件

Packet Tracer 8.2.0

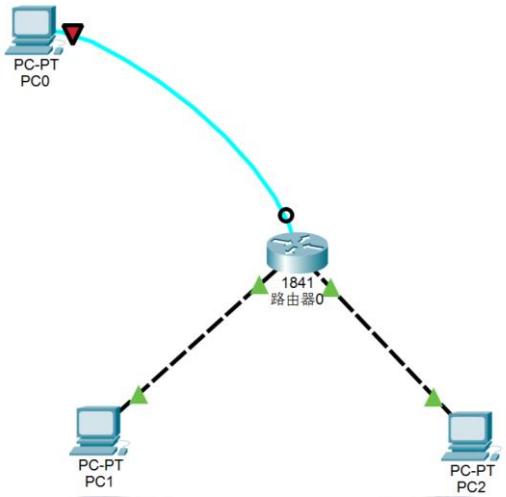
三、实验方案

部署好网络拓扑，并且配置好 IP 地址。然后按照实验指导书的内容，逐步完成本次实验的配置步骤。

四、实验步骤

（一）实验 10 路由器的基本配置

1. 建立如图所示的网络拓扑



名称	相连的接口	IP 地址	网关
PC0		172.1.1.2/28	
PC1	F0/0	192.168.1.2/24	192.168.1.1/24
PC2	F0/1	10.10.1.2/24	10.10.1.1/24
	S0/0	172.159.1.1/24	

2. 在路由器上配置 IP 地址和 Serial

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname RA
RA(config)#interface fastethernet 0/0
RA(config-if)#ip address 192.168.1.1 255.255.255.0
RA(config-if)#no shutdown

RA(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

RA(config-if)#interface fastethernet 0/1
RA(config-if)#ip address 10.10.1.1 255.255.255.0
RA(config-if)#no shutdown

RA(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

RA(config-if)#interface serial 0/0
%Invalid interface type and number
RA(config)#
RA(config)#interface serial 0/1/0
RA(config-if)#ip address 172.159.1.1 255.255.255.0
RA(config-if)#clock rate 64000
RA(config-if)#no shutdown
```

```
RA(config-if)#exit
RA(config)#exit
RA#
%SYS-5-CONFIG_I: Configured from console by console

RA#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        192.168.1.1     YES manual up                    up
FastEthernet0/1        10.10.1.1       YES manual up                    up
Serial0/1/0            172.159.1.1     YES manual down                  down
Vlan1                  unassigned      YES unset  administratively down down
RA#
```

（分别配置 F0/0 和 F0/1 的 IP 地址，并且配置 Serial）

3. 使用 PC1 ping PC2，成功

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.10.1.2

Pinging 10.10.1.2 with 32 bytes of data:

Request timed out.
Reply from 10.10.1.2: bytes=32 time<1ms TTL=127
Reply from 10.10.1.2: bytes=32 time<1ms TTL=127
Reply from 10.10.1.2: bytes=32 time=21ms TTL=127

Ping statistics for 10.10.1.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 21ms, Average = 7ms

C:\>
```

（最初分组丢失是因为最初还没有建立起路由表，之后三个分组都能够收到 reply）

4. 路由器配置远程登录

```
RA>enable
RA#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
RA(config)#line vty 0 4
RA(config-line)#login
RA(config-line)#password star
RA(config-line)#end
RA#
```

（在 RA 上设置远程登录，密码为 star）

5. 在 PC1 上测试

```
Cisco Packet Tracer PC Command Line 1.0
C:\>telnet 192.168.1.1
Trying 192.168.1.1 ...Open


User Access Verification

Password:
RA>
```

（此时的密码就是先前设置的 star，在 PC1 上登录成功，说明远程登录设置成功）

6. 路由器配置远端特权模式

```
RA>enable
RA#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
RA(config)#enable secret abc
RA(config)#enable password str
RA(config)#
```

（简单地重新配置即可，此处远端登录密码为 star，开启特权模式的二级密码为 abc）

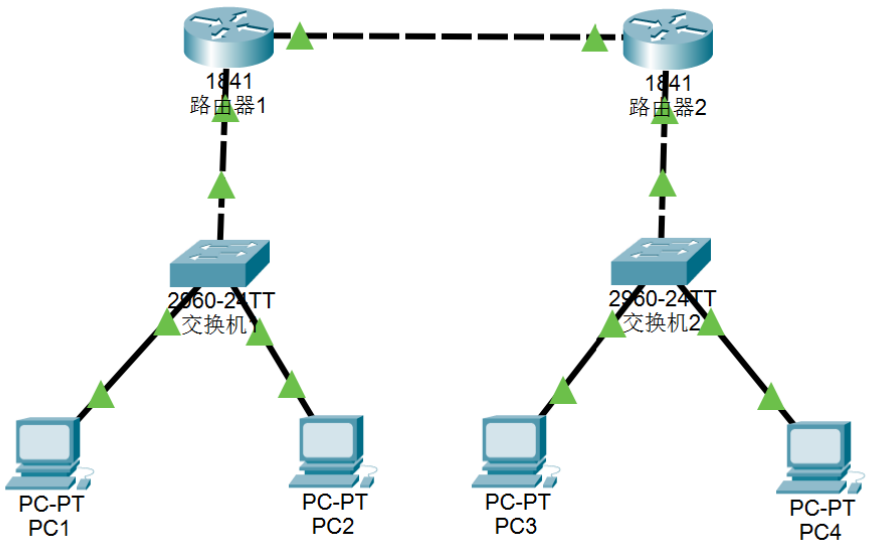
7. 路由器配置远端特权模式

```
Cisco Packet Tracer PC Command Line 1.0
C:\>telnet 192.168.1.1
Trying 192.168.1.1 ...Open


User Access Verification

Password:
Password:
RA>enable
Password:
RA#
```

（此时第一次的密码为 star，第二次的密码为 abc，成功开启特权模式，说明配置成功）

（二）实验 11 静态路由实验

1. 建立如图所示的网络拓扑



名称	接口	IP 地址	网关
Router A	F0/0	192.168.1.1/24	
	F0/1	172.1.1.1/24	
Router B	F0/0	172.2.2.1/24	
	F0/1	192.168.1.2/24	
PC1		172.1.1.2/24	172.1.1.1
PC2		172.1.1.3/24	172.1.1.1
PC3		172.2.2.2/24	172.2.2.1
PC4		172.2.2.3/24	172.2.2.1

2. 配置 Router A（路由器 1）和 Router B（路由器 2）

```
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#no ip domain-look
Router(config)#int f0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#int f0/1
Router(config-if)#ip address 172.1.1.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

(Router A 配置)

```
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#no ip domain-look
Router(config)#int f0/0
Router(config-if)#ip address 172.2.2.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#int f0/1
Router(config-if)#ip address 192.168.1.2 255.255.255.0
Router(config-if)#no shut
Router(config-if)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

(Router B 配置)

3. 使用 PC1 测试连通性

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.1.1.3

Pinging 172.1.1.3 with 32 bytes of data:

Request timed out.
Request timed out.
Reply from 172.1.1.3: bytes=32 time=1ms TTL=128
Reply from 172.1.1.3: bytes=32 time<1ms TTL=128

Ping statistics for 172.1.1.3:
    Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

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

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

（使用 PC1 ping PC2 和 Router B，Router B 无法连接）

4. 配置 RouterA 静态路由

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 172.2.2.0 255.255.255.0 192.168.1.2
Router(config)#end
Router#
```

5. 使用 PC1 测试连通性

```
C:\>ping 172.1.1.3

Pinging 172.1.1.3 with 32 bytes of data:

Reply from 172.1.1.3: bytes=32 time<1ms TTL=128
Reply from 172.1.1.3: bytes=32 time<1ms TTL=128
Reply from 172.1.1.3: bytes=32 time<1ms TTL=128
Reply from 172.1.1.3: bytes=32 time<1ms TTL=128

Ping statistics for 172.1.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

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

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

（PC1 仍然是可以 ping 通 PC2，不能 ping 通 Router B）

6. 配置 RouterA 静态路由

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 172.1.1.0 255.255.255.0 192.168.1.1
Router(config)#end
Router#
%SYS-5-CONFIG I: Configured from console by console
```

7. 使用 PC1 测试连通性

```
C:\>ping 172.2.2.1

Pinging 172.2.2.1 with 32 bytes of data:

Reply from 172.2.2.1: bytes=32 time<1ms TTL=254
Reply from 172.2.2.1: bytes=32 time<1ms TTL=254
Reply from 172.2.2.1: bytes=32 time<1ms TTL=254
Reply from 172.2.2.1: bytes=32 time<1ms TTL=254

Ping statistics for 172.2.2.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

（使用 PC1 ping Router B 终于成功）

8. 使用 PC1 进一步测试连通性

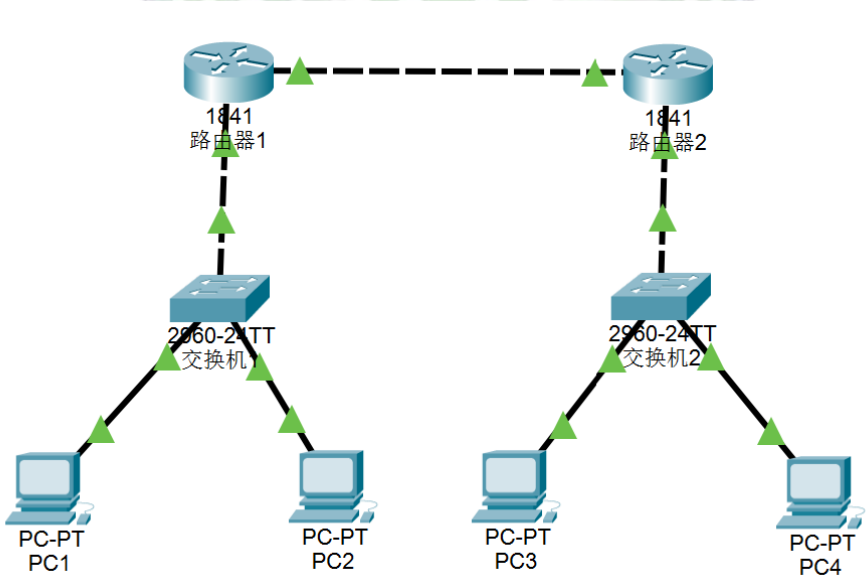
```
C:\>ping 172.1.1.3

Pinging 172.1.1.3 with 32 bytes of data:

Reply from 172.1.1.3: bytes=32 time<1ms TTL=128
Reply from 172.1.1.3: bytes=32 time<1ms TTL=128
Reply from 172.1.1.3: bytes=32 time<1ms TTL=128
Reply from 172.1.1.3: bytes=32 time<1ms TTL=128

Ping statistics for 172.1.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\>ping 172.2.2.2

Pinging 172.2.2.2 with 32 bytes of data:

Reply from 172.2.2.2: bytes=32 time<1ms TTL=126
Reply from 172.2.2.2: bytes=32 time<1ms TTL=126
Reply from 172.2.2.2: bytes=32 time=1ms TTL=126
Reply from 172.2.2.2: bytes=32 time=10ms TTL=126

Ping statistics for 172.2.2.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 10ms, Average = 2ms

C:\>ping 172.2.2.3

Pinging 172.2.2.3 with 32 bytes of data:

Request timed out.
Reply from 172.2.2.3: bytes=32 time=10ms TTL=126
Reply from 172.2.2.3: bytes=32 time=1ms TTL=126
Reply from 172.2.2.3: bytes=32 time=10ms TTL=126

Ping statistics for 172.2.2.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 10ms, Average = 7ms
```

（使用 PC1 分别 ping PC2、PC3、PC4，均成功，说明实验成功）

（三）实验 12 路由信息协议（RIP）实验

1. 建立如图所示的网络拓扑



名称	接口	IP 地址	网关
Router A	F0/0	192.168.1.1/24	
	F0/1	172.1.1.1/24	
Router B	F0/0	172.2.2.1/24	
	F0/1	192.168.1.2/24	
PC1		172.1.1.2/24	172.1.1.1
PC2		172.1.1.3/24	172.1.1.1
PC3		172.2.2.2/24	172.2.2.1
PC4		172.2.2.3/24	172.2.2.1

2. 分别配置 Router A 和 Router B 的基本配置

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#no ip domain-look
Router(config)#int f0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#int f0/1
Router(config-if)#ip address 172.1.1.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#end
Router#
```

（配置 Router A）

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#no ip domain-look
Router(config)#int f0/0
Router(config-if)#ip address 172.2.2.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#int f0/1
Router(config-if)#ip address 192.168.1.2 255.255.255.0
Router(config-if)#no shut
Router(config-if)#end
Router#
```

（配置 Router B）

3. 配置 Router A 和 Router B 的 RIP 路由。

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 172.1.1.0
Router(config-router)#network 192.168.1.0
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

（配置 Router A 的 RIP）

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 172.2.2.0
Router(config-router)#network 192.168.1.0
Router(config-router)#end
Router#
%SYS-5-CONFIG I: Configured from console by console
```

（配置 Router B 的 RIP）

4. 在两个路由器上展示各自的路由配置信息

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 172.1.1.0
Router(config-router)#network 192.168.1.0
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

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, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.1.0.0/24 is subnetted, 1 subnets
C       172.1.1.0 is directly connected, FastEthernet0/1
     172.2.0.0/16 is variably subnetted, 2 subnets, 2 masks
R       172.2.0.0/16 [120/1] via 192.168.1.2, 00:00:12, FastEthernet0/0
S       172.2.2.0/24 [1/0] via 192.168.1.2
C    192.168.1.0/24 is directly connected, FastEthernet0/0

Router#
```

（Router A 展示路由信息）

```
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, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.1.0.0/16 is variably subnetted, 2 subnets, 2 masks
R       172.1.0.0/16 [120/1] via 192.168.1.1, 00:00:21, FastEthernet0/1
S       172.1.1.0/24 [1/0] via 192.168.1.1
     172.2.0.0/24 is subnetted, 1 subnets
C       172.2.2.0 is directly connected, FastEthernet0/0
C    192.168.1.0/24 is directly connected, FastEthernet0/1

Router#
```

（Router B 展示路由信息）

5. 使用 PC1 测试连通性

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.1.1.3

Pinging 172.1.1.3 with 32 bytes of data:

Reply from 172.1.1.3: bytes=32 time=1ms TTL=128
Reply from 172.1.1.3: bytes=32 time<1ms TTL=128
Reply from 172.1.1.3: bytes=32 time<1ms TTL=128
Reply from 172.1.1.3: bytes=32 time<1ms TTL=128

Ping statistics for 172.1.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 172.2.2.2

Pinging 172.2.2.2 with 32 bytes of data:

Request timed out.
Reply from 172.2.2.2: bytes=32 time=1ms TTL=126
Reply from 172.2.2.2: bytes=32 time=1ms TTL=126
Reply from 172.2.2.2: bytes=32 time=10ms TTL=126

Ping statistics for 172.2.2.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 10ms, Average = 4ms

C:\>ping 172.2.2.1

Pinging 172.2.2.1 with 32 bytes of data:

Reply from 172.2.2.1: bytes=32 time<1ms TTL=254
Reply from 172.2.2.1: bytes=32 time=1ms TTL=254
Reply from 172.2.2.1: bytes=32 time<1ms TTL=254
Reply from 172.2.2.1: bytes=32 time<1ms TTL=254

Ping statistics for 172.2.2.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

（使用 PC1 ping PC2、PC3、PC4，均成功连通，说明实验成功）

五、实验结果及分析

本次实验的实验结果符合指导书的预期。在第一节学习了如何在命令行进行路由器的基本配置；第二节和第三节在此基础上尝试配置静态路由和使用 RIP 算法动态更新路由表。

六、实验总结及体会

在本次实验中，主要学习了路由器及路由算法的配置、选择，并直观理解了网络层在网络传输过程中的作用，对路由器的功能有了更深的理解。

七、教师评语