

网络层2：静态路由与默认路由配置

实验目的

1. 理解静态路由的含义。
2. 掌握路由器静态路由的配置方法。
3. 理解默认路由的含义。
4. 掌握默认路由的配置方法。

实验内容

1、基础知识。

静态路由是指路由信息由管理员手工配置，而不是路由器通过路由算法和其他路由器学习得到。所以，静态路由主要适合网络规模不大、拓扑结构相对固定的网络使用,当网络环境比较复杂时,由于其拓扑或链路状态相对容易变化，就需要管理员再手工改变路由，这对管理员来说是一个烦琐的工作，且网络容易受人的影响，对管理员不论技术上还是纪律上都有更高的要求。

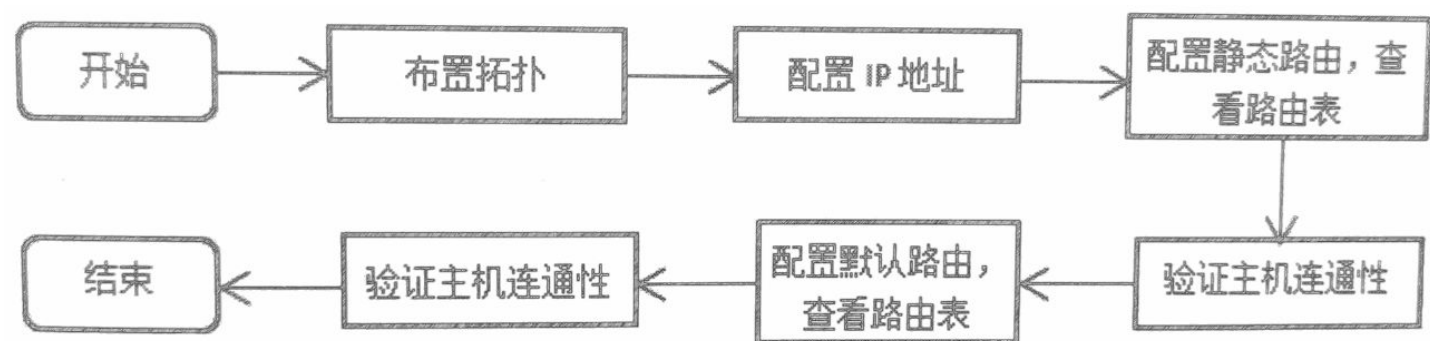
默认路由也是一种静态路由，它位于路由表的最后，当数据报与路由表中前面的表项都不匹配时，数据报将根据默认路由转发。这使得其在某些时候是非常有效的，例如在末梢网络中，默认路由可以大大简化路由器的项目数量及配置，减轻路由器和网络管理员的工作负担,可见,静态路由优先级高于默认路由。

常用配置命令如下所示。

- 配置静态路由格式：
Router(config)#ip route 目的网络号 目的网络掩码 下一跳IP地址
- 配置默认路由格式：
Router(config)#ip route 0.0.0.0 0.0.0.0 下一跳IP地址

2、实验流程

本实验配置静态路由和默认路由，要求各IP全部可达。实验流程如图所示。



实验步骤

1、布置拓扑。如下图所示，并按下表配置IP地址。

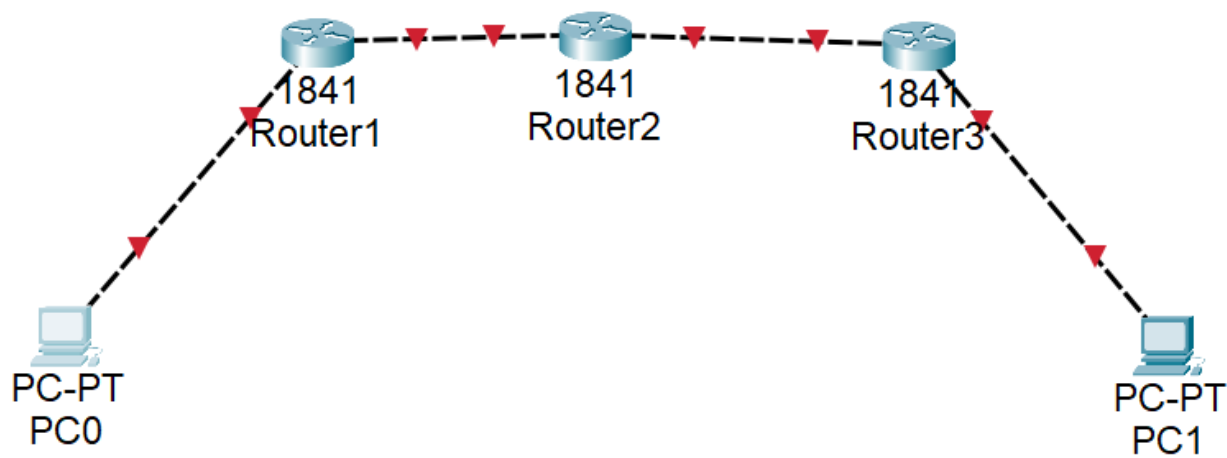


表 配置IP地址

设备名称	端口	IP地址	默认网关
路由器R1	Fa0/0	192.168.0.1	
路由器R1	Fa0/1	192.168.1.1	
路由器R2	Fa0/0	192.168.1.2	
路由器R2	Fa0/1	192.168.2.1	
路由器R2	Fa0/0	192.168.2.2	
路由器R2	Fa0/1	192.168.3.1	

设备名称	端口	IP地址	默认网关
PC1	Fa0	192.168.0.2	192.168.0.1
PC2	Fa0	192.168.3.2	192.168.3.1

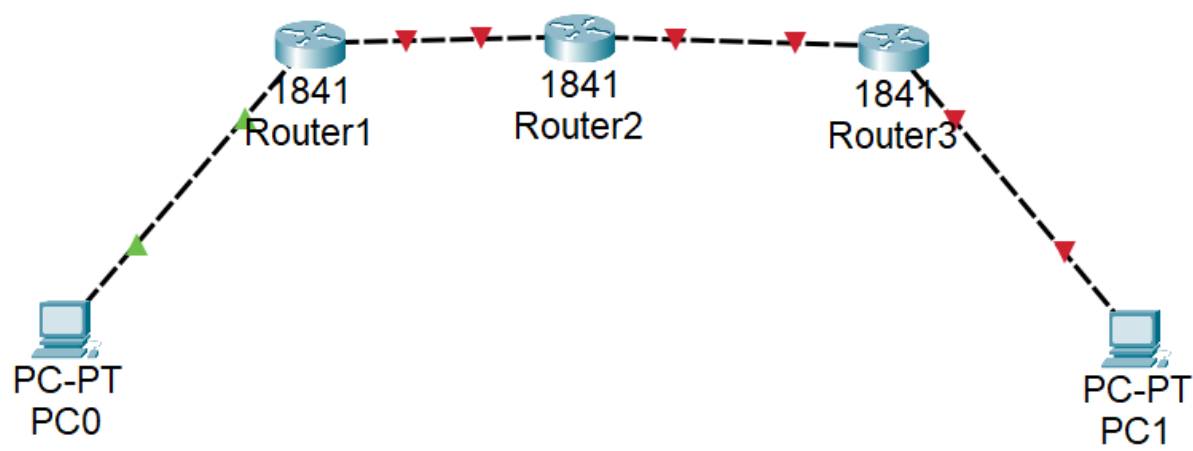
2、进入路由器R1的命令行界面，开启并设置端口IP：

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#no shutdown

Router(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
ip address 192.168.0.1 255.255.255.0
Router(config-if)#exit
Router(config)#interface FastEthernet0/1
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
ip address 192.168.1.1 255.255.255.0
Router(config-if)#
```



可以看到，键入命令“no shutdown”链接成功后会显示绿色。

3、进入路由器R2的命令行界面，开启并设置端口IP：

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#no shutdown

Router(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
ip address 192.168.1.2 255.255.255.0
Router(config-if)#exit
Router(config)#interface FastEthernet0/1
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
ip address 192.168.2.1 255.255.255.0
Router(config-if)#
```

4、进入路由器R3的命令行界面，开启并设置端口IP：

```
Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#no shutdown

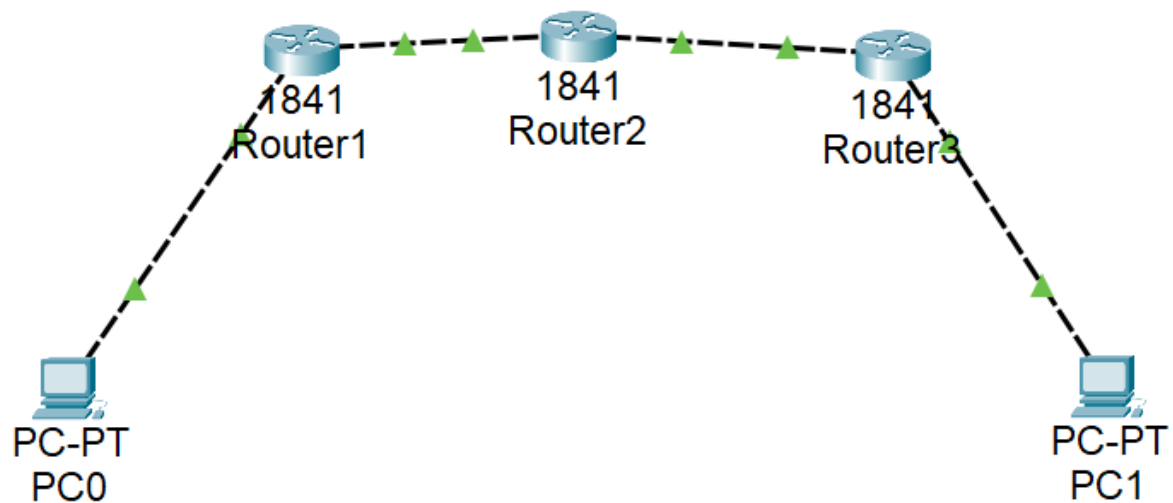
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
ip address 192.168.2.2 255.255.255.0
Router(config-if)#exit
Router(config)#interface FastEthernet0/1
Router(config-if)#no shutdown

Router(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
ip address 192.168.3.1 255.255.255.0
Router(config-if)#
```

5、此时，拓扑上的各个连接点应该都是绿的。



6、静态路由配置

路由器R1配置：

```
Router(config)#ip route 192.168.2.0 255.255.255.0 192.168.1.2
Router(config)#ip route 192.168.3.0 255.255.255.0 192.168.2.2
```

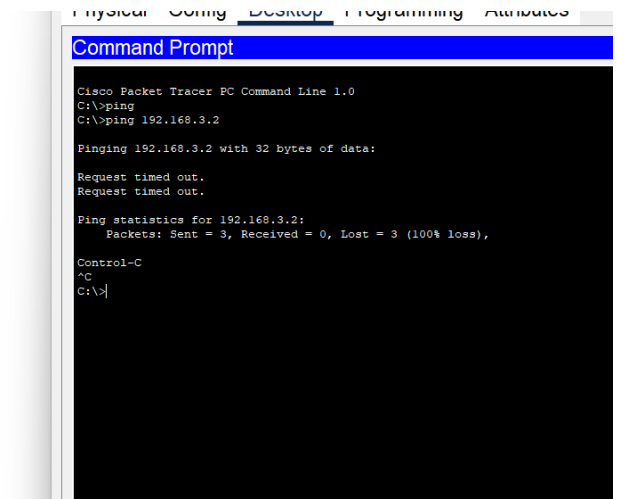
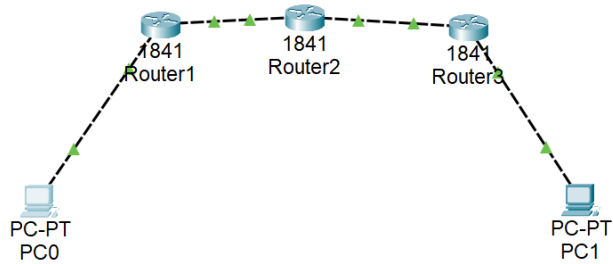
路由器R2配置：

```
Router(config)#ip route 192.168.0.0 255.255.255.0 192.168.1.1
Router(config)#ip route 192.168.3.0 255.255.255.0 192.168.2.2
```

路由器R3配置：

```
Router(config)#ip route 192.168.1.0 255.255.255.0 192.168.2.1
Router(config)#ip route 192.168.0.0 255.255.255.0 192.168.1.1
```

7、进入PC1的命令提示符界面， ping一下PC2的IP：



查看路由器的路由表，以R1为例，其中S开头的为静态路由，C开头的为直连路由。

```
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
```

```
C    192.168.0.0/24 is directly connected, FastEthernet0/0
C    192.168.1.0/24 is directly connected, FastEthernet0/1
S    192.168.2.0/24 [1/0] via 192.168.1.2
S    192.168.3.0/24 [1/0] via 192.168.2.2
```

```
Router#
```

R2的路由表：

```
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
```

```
S    192.168.0.0/24 [1/0] via 192.168.1.1
C    192.168.1.0/24 is directly connected, FastEthernet0/0
C    192.168.2.0/24 is directly connected, FastEthernet0/1
S    192.168.3.0/24 [1/0] via 192.168.2.2
```

```
Router#
```

R3的路由表:

```
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
```

```
S    192.168.0.0/24 [1/0] via 192.168.1.1
S    192.168.1.0/24 [1/0] via 192.168.2.1
C    192.168.2.0/24 is directly connected, FastEthernet0/0
C    192.168.3.0/24 is directly connected, FastEthernet0/1
```

```
Router#
```

8、默认路由配置。

对于路由器R1来说，其有两个直连网络，分别是192.168.0.0/24和 192.168.1.0/24，这两个网络不需要配置路由。通过前面的静态路由可知，R1 去 192.168.2.0/24和 192.168.3.0/24这两个网络的下一跳都是192.168.1.2，所以，这两个静态路由可以由一条指向192.168.1.2的默认路由代替。在前面配置的基础上，将静态路由删除（静态路由前面加 no），再增加一条默认路由即可。

```
Router(config)#no ip route 192.168.2.0 255.255.255.0 192.168.1.2
Router(config)#no ip route 192.168.3.0 255.255.255.0 192.168.2.2
Router(config)#ip route 0.0.0.0 0.0.0.0 192.168.1.2
Router(config)#
```

路由器R3的配置参考R0。

```
Router(config)#no ip route 192.168.0.0 255.255.255.0 192.168.1.1
Router(config)#no ip route 192.168.1.0 255.255.255.0 192.168.2.1
Router(config)#ip route 0.0.0.0 0.0.0.0 192.168.2.1
```

由PC1 ping PC2, 验证是否能ping通。

The image shows a Cisco Packet Tracer network diagram and a Command Prompt window. The network diagram illustrates a topology with three routers (Router1, Router2, Router3) and two PCs (PC0, PC1). Router1 is connected to PC0, Router2 is connected to PC1, and Router2 is connected to both Router1 and Router3. The Command Prompt window shows the results of a ping command from PC1 to PC2 (192.168.3.2), indicating a 100% loss of packets.

Physical x: 503, y: 463

Router1 Router2 Router3

PC-PT PC0 PC-PT PC1

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping
C:\>ping 192.168.3.2

Pinging 192.168.3.2 with 32 bytes of data:

Request timed out.
Request timed out.

Ping statistics for 192.168.3.2:
    Packets: Sent = 3, Received = 0, Lost = 3 (100% loss),

Control-C
^C
C:\>ping 192.168.3.2

Pinging 192.168.3.2 with 32 bytes of data:

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

Ping statistics for 192.168.3.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
C:\>
```