实验报告

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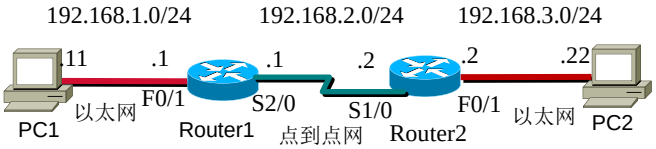
【实验题目】**静态路由实验**

【实验目的】掌握静态路由的配置和使用方法。

【实验拓扑】



【实验命令】

- 查看接口状态

```
#show interface
#show ip interface brief
#show ip interface f0/1
```

- 配置 IP 地址和子网掩码

(config)#**interface** serial 1/2　　!进行接口模式

(config-if)#**ip address** 192.168.1.11　255.255.255.0　!配置接口的 IP 地址和子网掩码

- 配置串口时钟和带宽

(config-if)#**clock rate** 64000　　!配置时钟频率 64000（在 DCE 上配置，DTE 不用配置）

(config-if)#**bandwidth** 512　　!配置端口的带宽速率为 512KB

- 配置静态路由

(config)#**ip route** network net-mask next-hop　! next-hop 可以为转发的串行接口名或下一跳的 IP 地址

例：**ip route**　192.168.3.0　255.255.255.0　192.168.2.2

　　ip route　192.168.3.0　255.255.255.0　S2/0

- 显示路由表

#show ip route

- 配置静态路由参数

(config)#**ip route** network net-mask next-hop　[distance]　[**weight** number]　[**disable**|**enable**]

！distance 设置管理距离（默认为 1），weight 为权重。

！将 distance 设置为一个大的值(例如，125。这大于 OSPF 的 110)可以作为备份路由。

- 配置默认路由

(config)# **ip route** 0.0.0.0　0.0.0.0　next-hop

例：**ip route**　0.0.0.0　0.0.0.0　192.168.2.1

【实验说明】

■配置前先重启路由器#reload

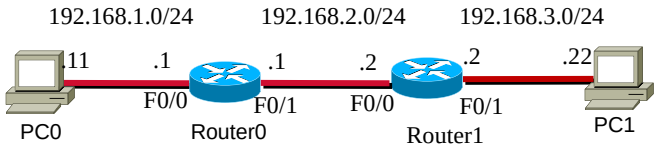
■参与 ping 的主机要删除校园网网关。

■注意关闭 Windows 的防火墙

以太网线　　串行电缆线

【实验任务】

实验报告



由于实际上所用的接口名不一定是上面标明的，先用#show ip interface brief 查看接口名，并根据实际接线修改上图的接口和 IP 地址标记。

配置好 PC 机的 IP 地址、子网掩码和默认网关，按下面步骤依次进行配置和测试（注意保存一些步骤的 pkt）：

(1) (static1.pkt)配置 Router0 和 Router1 的 IP 地址和子网掩码（见上面“实验命令”）。

[1a.显示 Router0 的路由表并截屏]

```
Router#sh ip rou
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    192.168.1.0/24 is directly connected, FastEthernet0/0
C    192.168.2.0/24 is directly connected, FastEthernet0/1
```

[1b.显示 Router1 的路由表并截屏]

```
Router#sh ip rou
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    192.168.2.0/24 is directly connected, FastEthernet0/0
C    192.168.3.0/24 is directly connected, FastEthernet0/1
```

[1c.PC0 依次 ping 到 PC1 路径上的所有 IP 地址，并截屏]

```
PC>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time=0ms TTL=255
Reply from 192.168.1.1: bytes=32 time=3ms TTL=255
Reply from 192.168.1.1: bytes=32 time=0ms TTL=255
Reply from 192.168.1.1: bytes=32 time=0ms TTL=255

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 3ms, Average = 0ms
```

```
PC>ping 192.168.2.1

Pinging 192.168.2.1 with 32 bytes of data:

Reply from 192.168.2.1: bytes=32 time=0ms TTL=255
Reply from 192.168.2.1: bytes=32 time=1ms TTL=255
Reply from 192.168.2.1: bytes=32 time=0ms TTL=255
Reply from 192.168.2.1: bytes=32 time=0ms TTL=255

Ping statistics for 192.168.2.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

```
PC>ping 192.168.2.2

Pinging 192.168.2.2 with 32 bytes of data:

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

Ping statistics for 192.168.2.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 192.168.3.2

Pinging 192.168.3.2 with 32 bytes of data:

Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Request timed out.
Reply from 192.168.1.1: Destination host unreachable.

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

```
PC>ping 192.168.3.22

Pinging 192.168.3.22 with 32 bytes of data:

Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.

Ping statistics for 192.168.3.22:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

[1d.指出 ping 不通的 IP 地址是在哪里出问题的(可以查看仿真的结果)并进行分析]

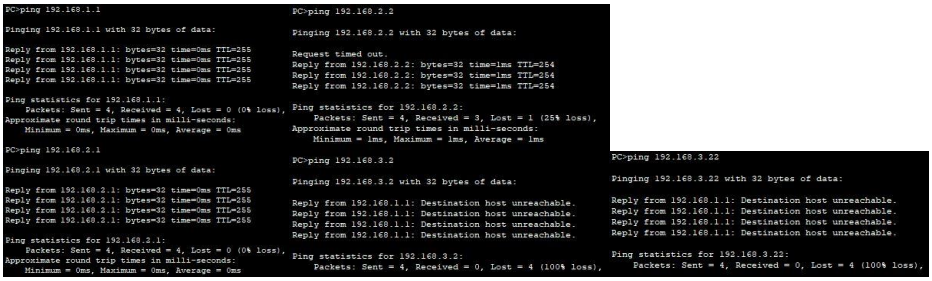
Router0 路由表为空，除 Router0 上的端口外，其他地方均无法 ping 到。其中 192.168.2.2 是可以接触到的，但因为确认包在 Router1 上没有路由表，无法发到 PC0，而 192.168.3.0/24 是不能接触到的子网，所以 ping 失败返回了不同的信息。

(2) (static2.pkt)在 Router1 上配置 192.168.1.0/24 的静态路由指向 Router0。

[2a.显示 Router1 的路由表并截屏]

```
Router#sh ip rou
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    192.168.1.0/24 [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
```

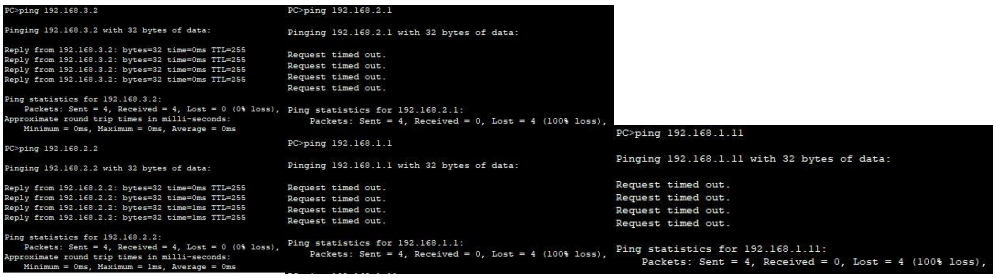
[2b.PC0 依次 ping 到 PC1 路径上的所有 IP 地址，并截屏]



[2c.指出上面 ping 不通的 IP 地址是在哪里出问题的(可以查看仿真的结果)并进行分析]

Router1 中无 192.168.3.0 的路由表，192.168.3.0/24 子网无法到达。即包卡在了 Router1。

[2d.PC1 依次 ping 到 PC0 路径上的所有 IP 地址，并截屏]



[2e.指出上面 ping 不通的 IP 地址是在哪里出问题的(可以查看仿真的结果)并进行分析]

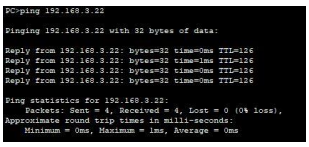
只有 192.168.1.0/24ping 不通，但实际上包是到达了的，只是确认包在经过 Router0 时，没有路由表，无法返回。

(3) (static3.pkt)在 Router0 上配置静态路由 192.168.3.0/24 的静态路由指向 Router1。

[3a.显示 Router0 的路由表并截屏]

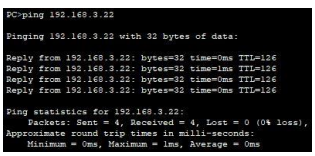
```
Router#sh ip rou
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       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    192.168.1.0/24 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
```

[3b.PC0 ping PC1，并截屏]



(4) (static4.pkt)如果在路由器 Router0 和 Router1 只配置默认路由指向对方（要先删除原静态路由）。

[4a.PC0 ping PC1，并截屏]



[4b.显示 Router0 的路由表并截屏]

```
Router#sh ip rou
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 192.168.2.2 to network 0.0.0.0

C    192.168.1.0/24 is directly connected, FastEthernet0/0
C    192.168.2.0/24 is directly connected, FastEthernet0/1
S*   0.0.0.0/0 [1/0] via 192.168.2.2
```

[4c.显示 Router1 的路由表并截屏]

```
Router#sh ip rou
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 192.168.2.1 to network 0.0.0.0

C    192.168.2.0/24 is directly connected, FastEthernet0/0
C    192.168.3.0/24 is directly connected, FastEthernet0/1
S*   0.0.0.0/0 [1/0] via 192.168.2.1
```

[4d. 分析结果]

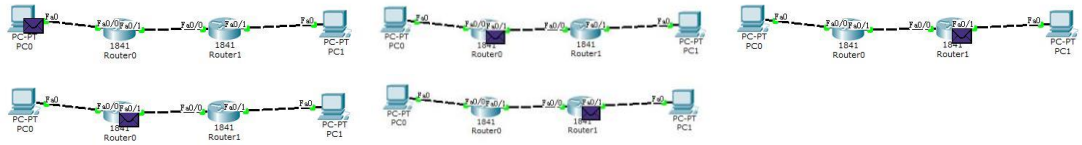
所有包都会发给另一个路由器，所以 ping 通了。

(5) 在上个步骤及基础上，用 PC0 ping 一个不属于实验中的任何子网的 IP 地址,

[5a. 截屏结果]

```
PC>ping 192.168.4.0

Pinging 192.168.4.0 with 32 bytes of data:

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

Ping statistics for 192.168.4.0:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

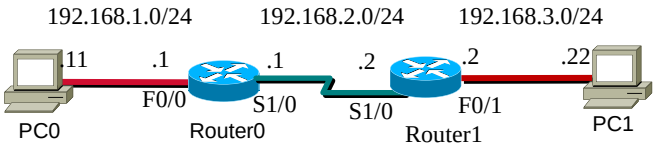
[5b. 启动仿真画面显示结果截屏]



[5c. 分析结果]

该包会在两个路由器之间不停的传，而 PC0 则会超时。

(6) (static6.pkt)按下图设计网络，配置 Router0 和 Router1 串行口的时钟、IP 地址和子网掩码，采用接口名作为下一跳配置静态路由（只有串行接口才可以这样做），令 PC0 可以 ping 通 PC1。



[6a.用 PC0 ping PC1 并截屏]

```
PC>ping 192.168.3.22

Pinging 192.168.3.22 with 32 bytes of data:

Reply from 192.168.3.22: bytes=32 time=3ms TTL=126
Reply from 192.168.3.22: bytes=32 time=1ms TTL=126
Reply from 192.168.3.22: bytes=32 time=5ms TTL=126
Reply from 192.168.3.22: bytes=32 time=5ms TTL=126

Ping statistics for 192.168.3.22:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 5ms, Average = 3ms
```

[6b.显示 Router0 的路由表并截屏]

```
Router#sh ip rou
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    192.168.1.0/24 is directly connected, FastEthernet0/0
C    192.168.2.0/24 is directly connected, Serial0/1/0
S    192.168.3.0/24 is directly connected, Serial0/1/0
```

[6c.显示 Router1 的路由表并截屏]

```
Router#sh ip rou
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    192.168.1.0/24 is directly connected, Serial0/1/0
C    192.168.2.0/24 is directly connected, Serial0/1/0
C    192.168.3.0/24 is directly connected, FastEthernet0/1
```

[6d.用#show running-config 显示 Router0 的当前配置并截屏]

```
Router#show running-config
Building configuration...

Current configuration : 790 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
spanning-tree mode pvst
!
!
!
!
```

```
interface FastEthernet0/0
 ip address 192.168.1.1 255.255.255.0
 duplex auto
 speed auto
!
interface FastEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface Serial0/0/0
 no ip address
 shutdown
!
interface Serial0/0/1
 no ip address
 shutdown
!
interface Serial0/1/0
 ip address 192.168.2.1 255.255.255.0
 clock rate 64000
!
interface Serial0/1/1
 no ip address
 shutdown
!
interface Vlan1
 no ip address
 shutdown
!
```

```
interface Vlan1
 no ip address
 shutdown
!
router rip
!
ip classless
ip route 192.168.3.0 255.255.255.0 Serial0/1/0
!
!
!
!
!
!
line con 0
!
line aux 0
!
line vty 0 4
 login
!
!
!
end
```

[6e.用#show running-config 显示 Router1 的当前配置并截屏]

```
Router#sh run
Building configuration...

Current configuration : 759 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
spanning-tree mode pvst
!
!
!
!
```

```
interface FastEthernet0/0
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface FastEthernet0/1
 ip address 192.168.3.2 255.255.255.0
 duplex auto
 speed auto
!
interface Serial0/0/0
 no ip address
 shutdown
!
interface Serial0/0/1
 no ip address
 shutdown
!
interface Serial0/1/0
 ip address 192.168.2.2 255.255.255.0
!
interface Serial0/1/1
 no ip address
 shutdown
!
interface Vlan1
 no ip address
 shutdown
!
```

```
ip classless
ip route 192.168.1.0 255.255.255.0 Serial0/1/0
!
!
!
!
!
!
line con 0
!
line aux 0
!
line vty 0 4
 login
!
!
!
end
```

(7) (static7.pkt)在上一个步骤的配置中删除用接口名作为下一跳的静态路由，然后配置用 IP 地址作为下一跳的静态路由，令 PC0 可以 ping 通 PC1。

[7a.用 PC0 ping PC1 并截屏]

```
PC>ping 192.168.3.22

Pinging 192.168.3.22 with 32 bytes of data:

Reply from 192.168.3.22: bytes=32 time=10ms TTL=126
Reply from 192.168.3.22: bytes=32 time=5ms TTL=126
Reply from 192.168.3.22: bytes=32 time=6ms TTL=126
Reply from 192.168.3.22: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.3.22:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 10ms, Average = 5ms
```

[7b.显示 Router0 的路由表并截屏]

```
Router>ena
Router#sh ip rou
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    192.168.1.0/24 is directly connected, FastEthernet0/0
C    192.168.2.0/24 is directly connected, Serial0/1/0
S    192.168.3.0/24 [1/0] via 192.168.2.2
```

[7c.显示 Router1 的路由表并截屏]

```
Router>ena
Router#sh ip rou
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    192.168.1.0/24 [1/0] via 192.168.2.1
C    192.168.2.0/24 is directly connected, Serial0/1/0
C    192.168.3.0/24 is directly connected, FastEthernet0/1
```

[7d.用#show running-config 显示 Router0 的当前配置并截屏]

实验报告

```
Router#sh run
Building configuration...

Current configuration : 790 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
!
!
!
!
!
!
spanning-tree mode pvst
!
!
!
!
!
interface FastEthernet0/0
 ip address 192.168.1.1 255.255.255.0
 duplex auto
 speed auto
!
interface FastEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface Serial0/0/0
 no ip address
 shutdown
!
interface Serial0/0/1
 no ip address
 shutdown
!
interface Serial0/1/0
 ip address 192.168.2.1 255.255.255.0
 clock rate 64000
!
interface Serial0/1/1
 no ip address
 shutdown
!
interface Vlan1
 no ip address
 shutdown
!
router rip
!
ip classless
ip route 192.168.3.0 255.255.255.0 192.168.2.2
!
!
!
!
!
!
line con 0
!
line aux 0
!
line vty 0 4
 login
!
!
!
end
```

[7e.用#show running-config 显示 Router1 的当前配置并截屏]

```
Router#sh run
Building configuration...

Current configuration : 759 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
!
!
!
!
!
!
spanning-tree mode pvst
!
!
!
!
!
interface FastEthernet0/0
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface FastEthernet0/1
 ip address 192.168.3.2 255.255.255.0
 duplex auto
 speed auto
!
interface Serial0/0/0
 no ip address
 shutdown
!
interface Serial0/0/1
 no ip address
 shutdown
!
interface Serial0/1/0
 ip address 192.168.2.2 255.255.255.0
!
interface Serial0/1/1
 no ip address
 shutdown
!
interface Vlan1
 no ip address
 shutdown
!
ip classless
ip route 192.168.1.0 255.255.255.0 192.168.2.1
!
!
!
!
!
!
line con 0
!
line aux 0
!
line vty 0 4
 login
!
!
!
end
```

【实验体会】

写出实验过程中的问题，思考及解决方法，简述实验体会（如果有的话）

坑 1.在实验的第一步，配置好路由器的各接口参数后，需要将接口打开，否则都是无连接的状态。

坑 2.PC 忘记设置默认路由（网关），导致包怎么都发不出去，只会卡在 PC 处。

【完成情况】

是否完成以下步骤？（√完成 ×未做）

(1) [√] (2) [√] (3) [√] (4) [√] (5) [√] (6) [√] (7) [√]

【交实验报告】

交实验报告地址：http://103.26.79.35/netdisk/default.aspx?vm=18net

截止日期(不迟于)：2020 年 6 月 30 日(周二)23:00

上传文件名：学号_姓名_静态路由.doc

学号_姓名_静态路由.rar (所有 pkt 文件)