合肥工業大學

《计算机网络系统实践》报告

设计题目：路由器配置实验

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一、实验目的

1. 认识路由器的端口、型号
2. 掌握路由器的路由配置
3. 理解网络互联的基本原理

二、实验环境与设备

本实验在 PC 机上利用模拟软件 Packet Tracer V6 进行操作。

三、实验内容

1. 路由器接口的配置
2. 静态路由配置
3. 默认路由配置
4. 动态路由配置

本次实验的主要任务是了解路由器的基本设置，和网络之间的连接关系。通过这次的实验很好的掌握了各个网段之间的，各个路由器下的 pc 的连接情况。通过对静态，默认，动态路由配置，使得各个路由器下的 PC 相互通信。

四、实验步骤和结果

1. 路由器接口的配置

（1）创建拓扑结构图。

（2） 配置主机 PC0，PC1，PC2

网络设备	接口	IP 地址	子网掩码	默认网关
PC0	FastEthernet	192.168.1.2	255.255.255.0	192.168.1.1
PC1	FastEthernet	192.168.2.2	255.255.255.0	192.168.2.1
PC2	FastEthernet	192.168.3.2	255.255.255.0	192.168.3.1

（3）router0 配置结果

```
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

     172.16.0.0/24 is subnetted, 1 subnets
C       172.16.1.0 is directly connected, Serial2/0
C    192.168.1.0/24 is directly connected, FastEthernet0/0
Router>
```

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（4）router1 配置结果

```
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

     172.16.0.0/24 is subnetted, 1 subnets
C       172.16.2.0 is directly connected, Serial2/0
C    192.168.2.0/24 is directly connected, FastEthernet0/0
```

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（5）router2 配置结果

```
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 inte
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 2 subnets
C       172.16.1.0 is directly connected, Serial2/0
C       172.16.2.0 is directly connected, Serial3/0
C    192.168.3.0/24 is directly connected, FastEthernet0/0
Router>
```

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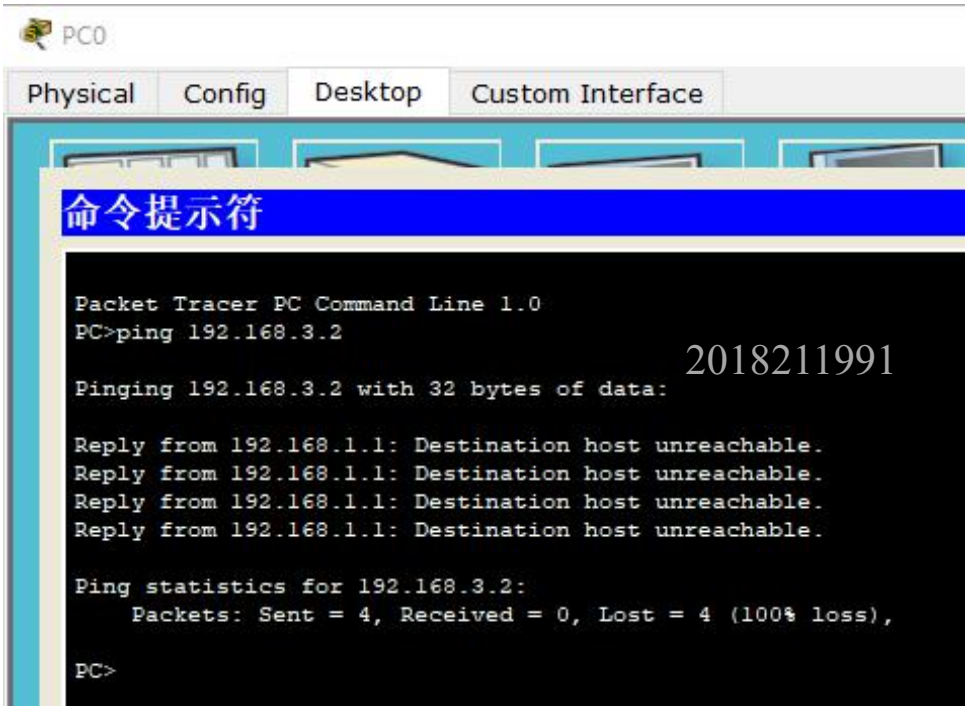
（6）测试 pc0 和 pc2 连通性



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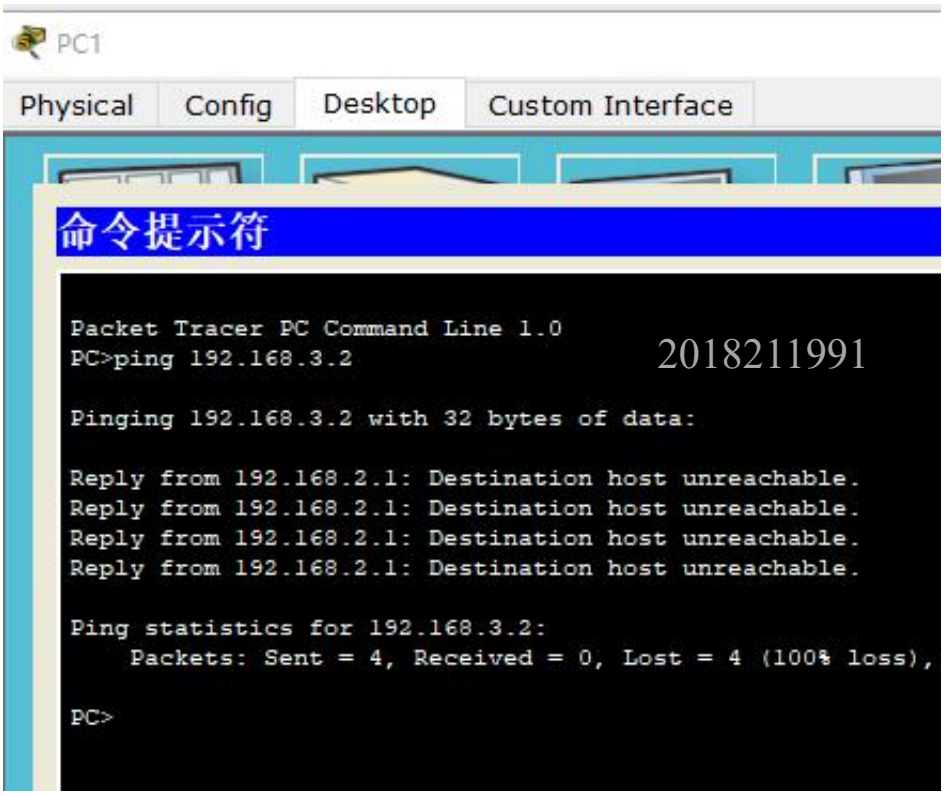
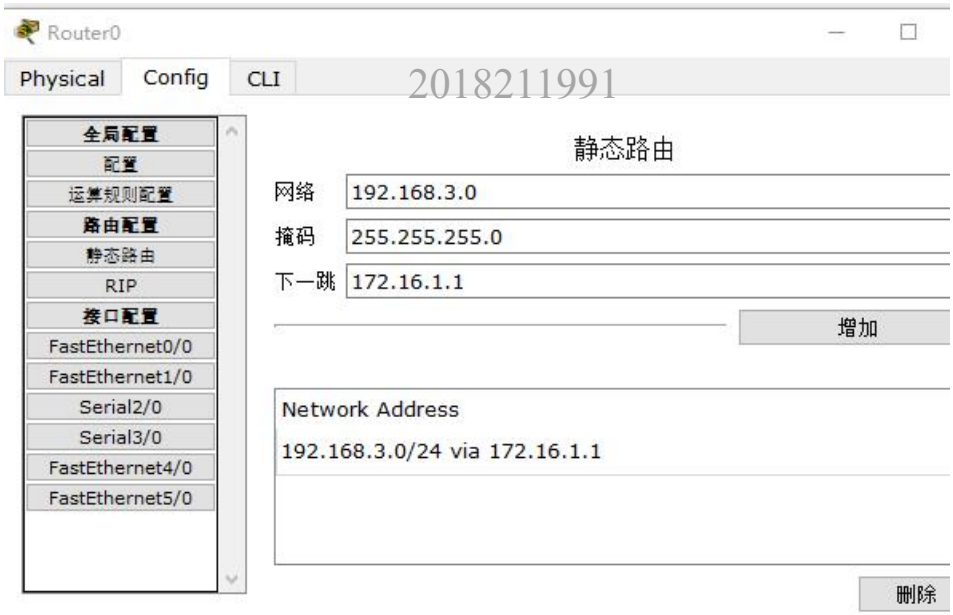
（7）测试 pc1 和 pc2 连通性



可以看到，因为不在同一个网段，在未配置路由的情况下，主机之间无法联通。

2.配置静态路由

（1）router0 增加静态路由



router0 路由表：

```
Router(config)#
Router(config)#exit
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 inte
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 1 subnets
C       172.16.1.0 is directly connected, Serial2/0
C    192.168.1.0/24 is directly connected, FastEthernet0/0
S    192.168.3.0/24 [1/0] via 172.16.1.1
Router#
```

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（2）router2 增加静态路由

router2 路由表：

```
Router(config)#exit
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

     172.16.0.0/24 is subnetted, 2 subnets
C       172.16.1.0 is directly connected, Serial2/0
C       172.16.2.0 is directly connected, Serial3/0
S    192.168.1.0/24 [1/0] via 172.16.1.2
C    192.168.3.0/24 is directly connected, FastEthernet0/0
Router#
```

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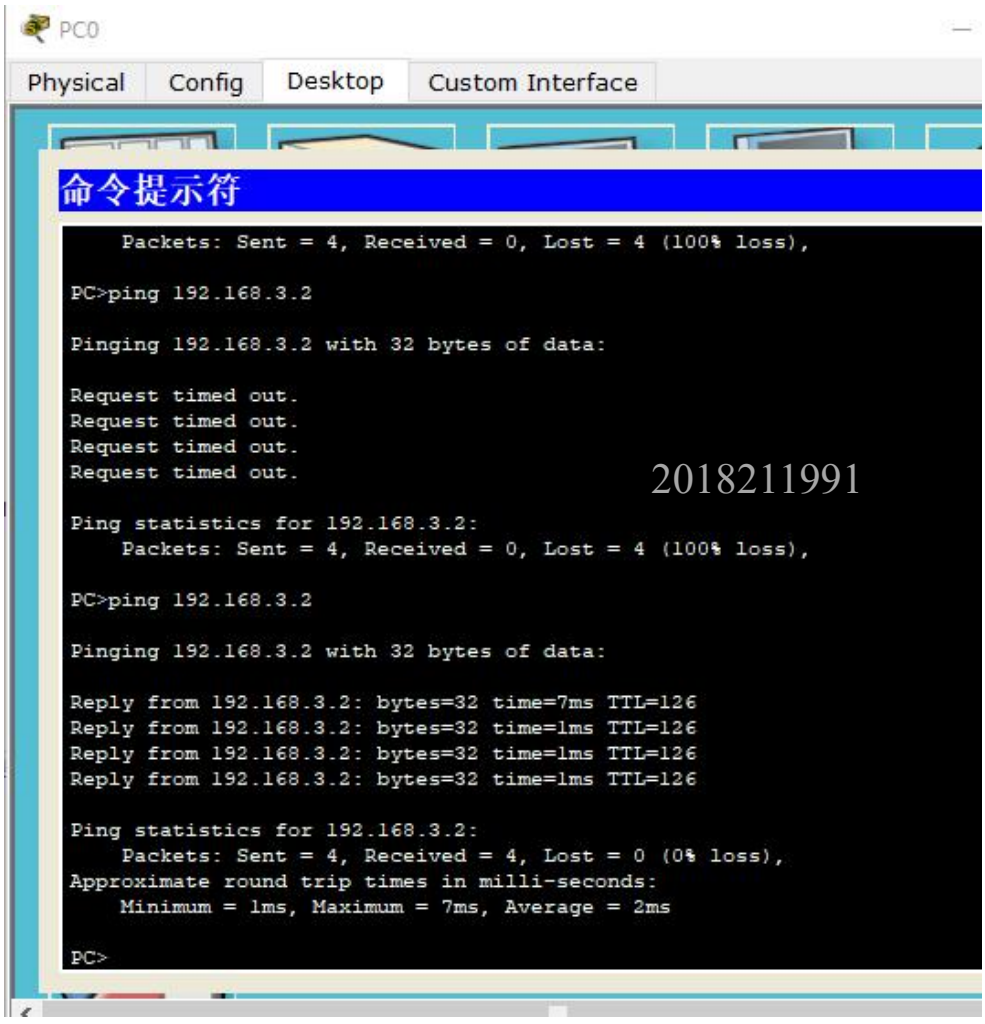
（3）测试 pc0 和 pc2 连通性



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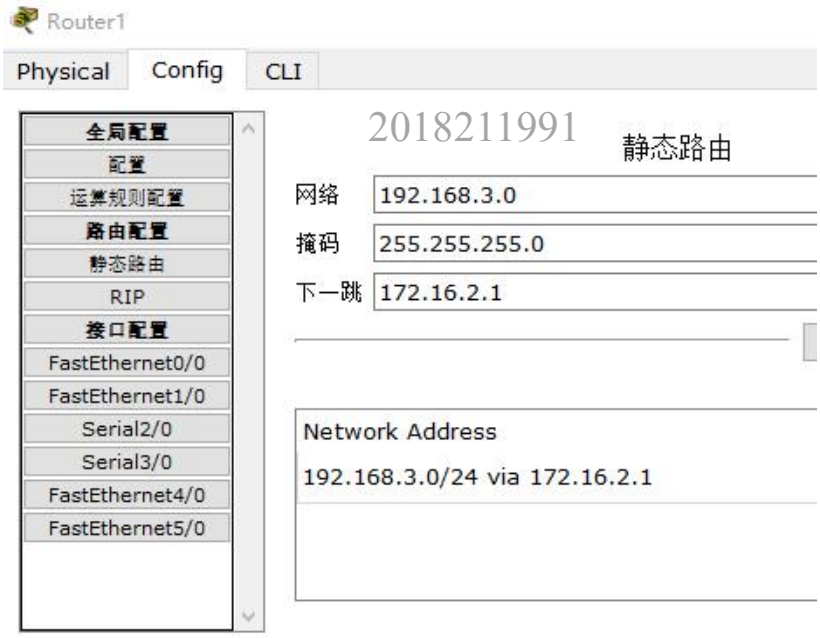
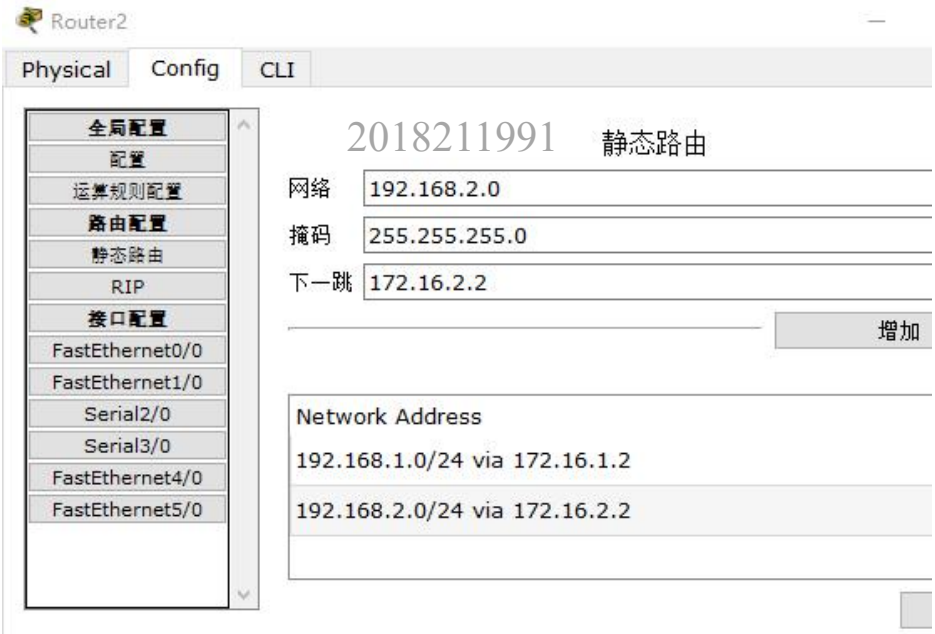
发现成功连通，同理继续配置静态路由。

（4）router2 增加静态路由

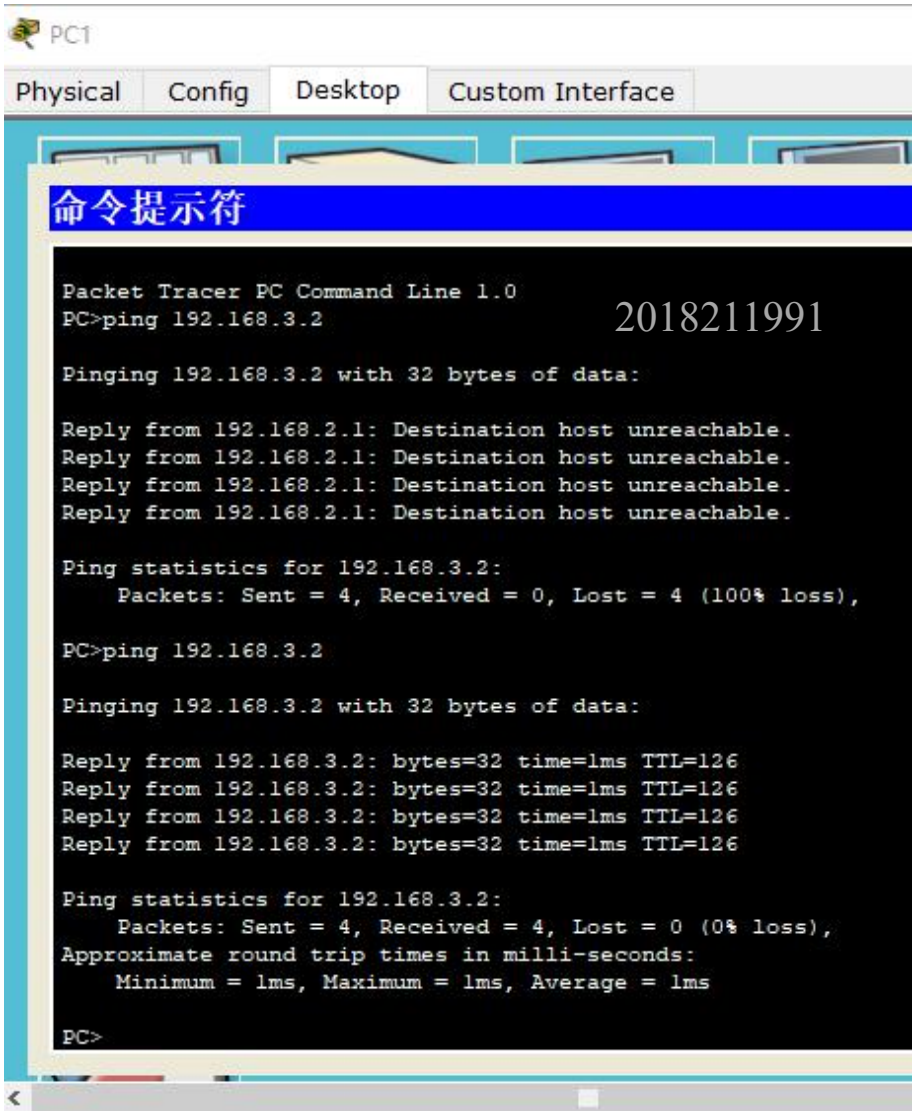
router1：



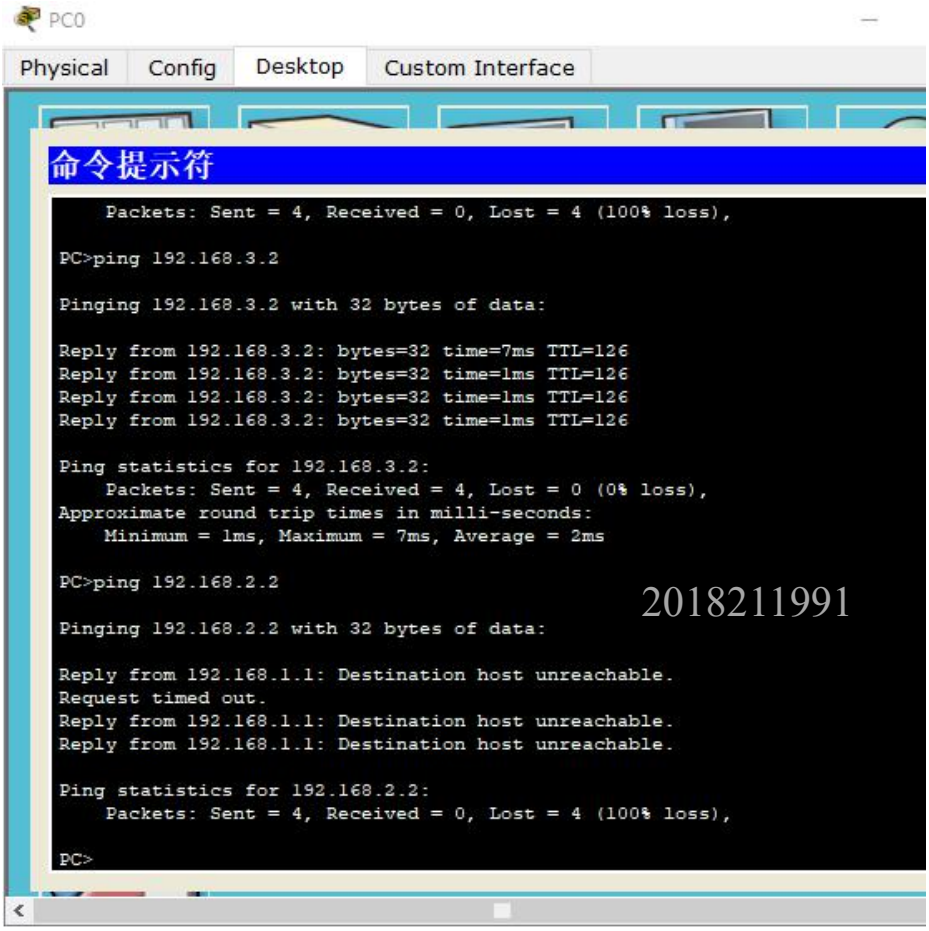
router2：



（5）测试 pc1 与 pc2 的连通性

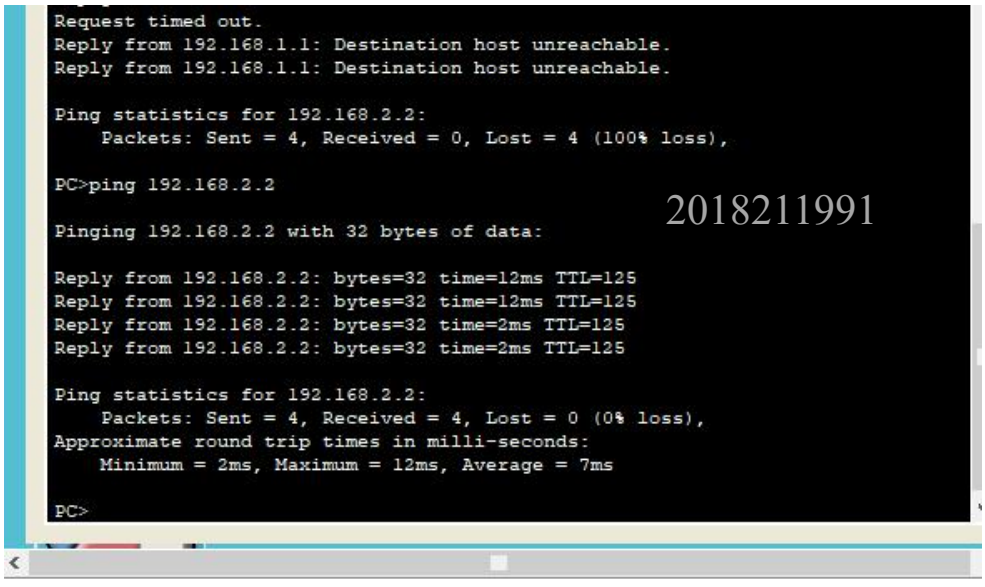


（6）测试 pc0 与 pc1 的连通性



pc0 与 pc1 不连通，继续添加静态路由，使其连通。

（7）增加路由后，测试 pc0 与 pc1 的连通性



3. 设置默认路由

PC0 想要访问 PC1 和 PC2 所在网络，需要在 Router0 中添加两条静态路由。这两条静态 路由的下一跳 IP 地址相同，并且 Router0 所在网络只有一条通路连接其它网络。这种情 况下，如果使用默认路由，则 Router0 只需设置一条默认路由就可使 PC0 可访问 PC1 和 PC2，这样 Router0 的路由表将更加简单。

（1）首先删除 Router0 中到达 PC1 和 PC2 所在网络

Router#conf t

Router(config)#no ip route 192.168.2.0 255.255.255.0

Router(config)#no ip route 192.168.3.0 255.255.255.0

Router(config)#exit

```
Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 1 subnets
C       172.16.1.0 is directly connected, Serial2/0
C    192.168.1.0/24 is directly connected, FastEthernet0/0
```

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（2）在 Router0 中添加一条默认路由

Router#conf t

Router(config)#ip route 0.0.0.0 0.0.0.0 172.16.1.1

```
Gateway of last resort is 172.16.1.1 to network 0.0.0.0

     172.16.0.0/24 is subnetted, 1 subnets
C       172.16.1.0 is directly connected, Serial2/0
C    192.168.1.0/24 is directly connected, FastEthernet0/0
S*   0.0.0.0/0 [1/0] via 172.16.1.1
```

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（3）再测试 PC0 与 PC1,PC2 的连通性

```
PC>ping 192.168.2.2

Pinging 192.168.2.2 with 32 bytes of data:

Reply from 192.168.2.2: bytes=32 time=12ms TTL=125
Reply from 192.168.2.2: bytes=32 time=12ms TTL=125
Reply from 192.168.2.2: bytes=32 time=2ms TTL=125
Reply from 192.168.2.2: bytes=32 time=2ms TTL=125

Ping statistics for 192.168.2.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 12ms, Average = 7ms

PC>
```

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```
PC>ping 192.168.3.2

Pinging 192.168.3.2 with 32 bytes of data:

Reply from 192.168.3.2: bytes=32 time=7ms TTL=126
Reply from 192.168.3.2: bytes=32 time=1ms TTL=126
Reply from 192.168.3.2: bytes=32 time=1ms TTL=126
Reply from 192.168.3.2: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.3.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 7ms, Average = 2ms

PC>
```

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3.动态路由协议 RIP 的配置

（1）配置 router0

```
Router(config)#route rip
Router(config-router)#network 192.168.1.0
Router(config-router)#network 172.16.1.0
Router(config-router)#exit
Router(config)#
```

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（2）配置 router1

```
Router(config-router)#network 172.16.2.0
Router(config-router)#network 192.168.2.0
Router(config-router)#network 192.168.2.0
Router(config-router)#exit
Router(config)#
```

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（3）配置 router2

```
Router(config)#router rip
Router(config-router)#network 172.16.1.0
Router(config-router)#network 172.16.2.0
Router(config-router)#network 172.168.3.0
Router(config-router)#exit
Router(config)#
```

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（4）router0 1 2 的路由表分别如下

```
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 inte
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 2 subnets
C       172.16.1.0 is directly connected, Serial2/0
R       172.16.2.0 [120/1] via 172.16.1.1, 00:00:13, Serial2/0
C    192.168.1.0/24 is directly connected, FastEthernet0/0
R    192.168.2.0/24 [120/2] via 172.16.1.1, 00:00:13, Serial2/0
R    192.168.3.0/24 [120/1] via 172.16.1.1, 00:00:13, Serial2/0
Router#
```

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```
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

     172.16.0.0/24 is subnetted, 2 subnets
R       172.16.1.0 [120/1] via 172.16.2.1, 00:00:11, Serial2/0
C       172.16.2.0 is directly connected, Serial2/0
R    192.168.1.0/24 [120/2] via 172.16.2.1, 00:00:11, Serial2/0
C    192.168.2.0/24 is directly connected, FastEthernet0/0
R    192.168.3.0/24 [120/1] via 172.16.2.1, 00:00:11, Serial2/0
Router#
```

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```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGI
       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 int
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 2 subnets
C       172.16.1.0 is directly connected, Serial2/0
C       172.16.2.0 is directly connected, Serial3/0
R    192.168.1.0/24 [120/1] via 172.16.1.2, 00:00:29, Serial2/0
R    192.168.2.0/24 [120/1] via 172.16.2.2, 00:00:03, Serial3/0
C    192.168.3.0/24 is directly connected, FastEthernet0/0
Router#
```

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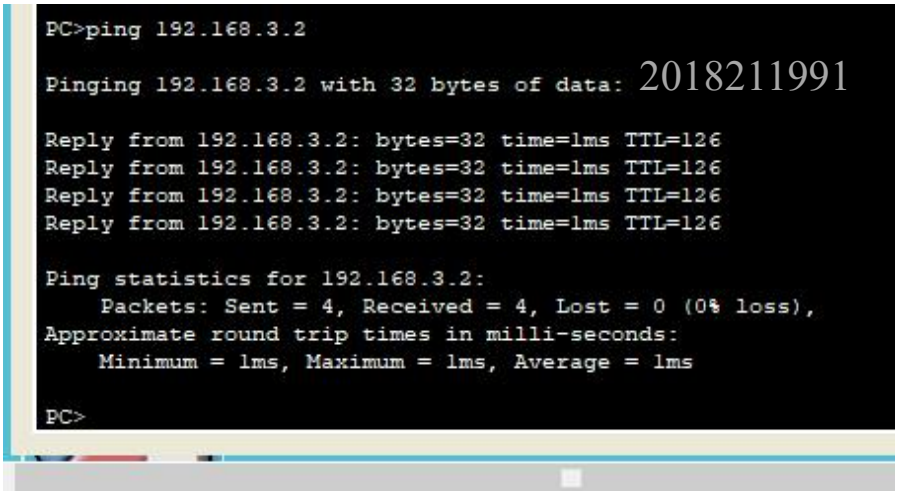
（5）测试 pc0 1 2 之间的连通性



结果：三个主机之间均能互相连通（上图为 pc1 和 pc2 之间的结果）。

五、实验总结

此次实验使我了解了如何手动配置静态路由和设置动态路由选择协议，加深了我对路由选择、最长前缀匹配等知识的理解。实验中也遇到过一点小问题，例如起初配置完成后无法连通，本以为是配置错误，检查无误后发现只需要多尝试几次就能成功连通。