《计算机网络》实验报告

信息 学院 计算机科学与技术 专业 2020 级

实验时间 2022 年 11 月 14 日

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实验名称 静态路由实验

实验成绩

一、实验目的

（1）掌握路由器的基本配置：关闭域名解释、设置路由器接口 IP 地址。

（2）根据以上拓扑划分出的三个网段配置静态路由，使所有主机都能相互通信。

（3）配置默认路由。

（4）了解 ping 命令和 trace 命令的原理和使用方法

二、实验仪器设备及软件

（1）Cisco Packet Tracer 8.2.0 模拟器

（2）4 台 PC

（3）2 台 2811 路由器

三、实验方案

使用 2811 路由器进行实验，PC 两两一组放到两个网段中，并为两个路由器配置接口 IP 地址及静态路由。最后查看路由表并使用 trace 测试路由的路线。

四、实验步骤

1. 路由器的基本配置

（1）配置两个路由器的接口 IP 地址并将其开启

（2）配置各 PC 的 IP 地址及默认网关

2. 配置静态路由

（1）给路由器 A 和路由器 B 分别配上路由表项，使能互相到达

（2）测试两个网段是否能够互相 ping 通

（3）在 PC1 上使用 tracert 命令测试到 PC3 的路由路径

3. 配置路由器的默认路由

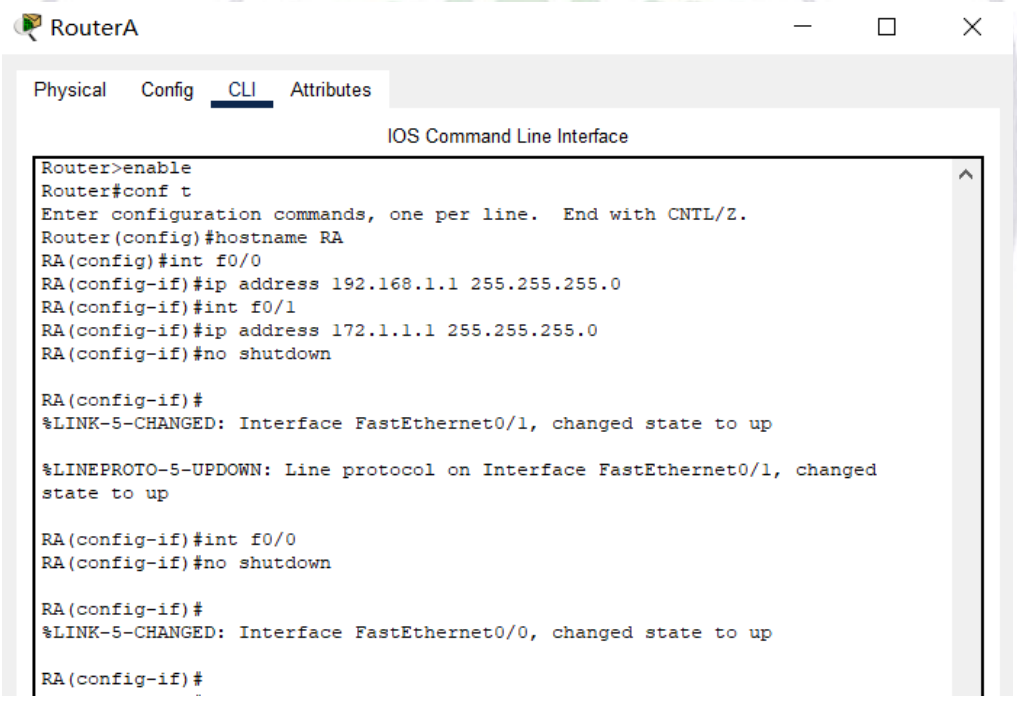
（1）配置两个路由器的默认路由

五、实验结果及分析

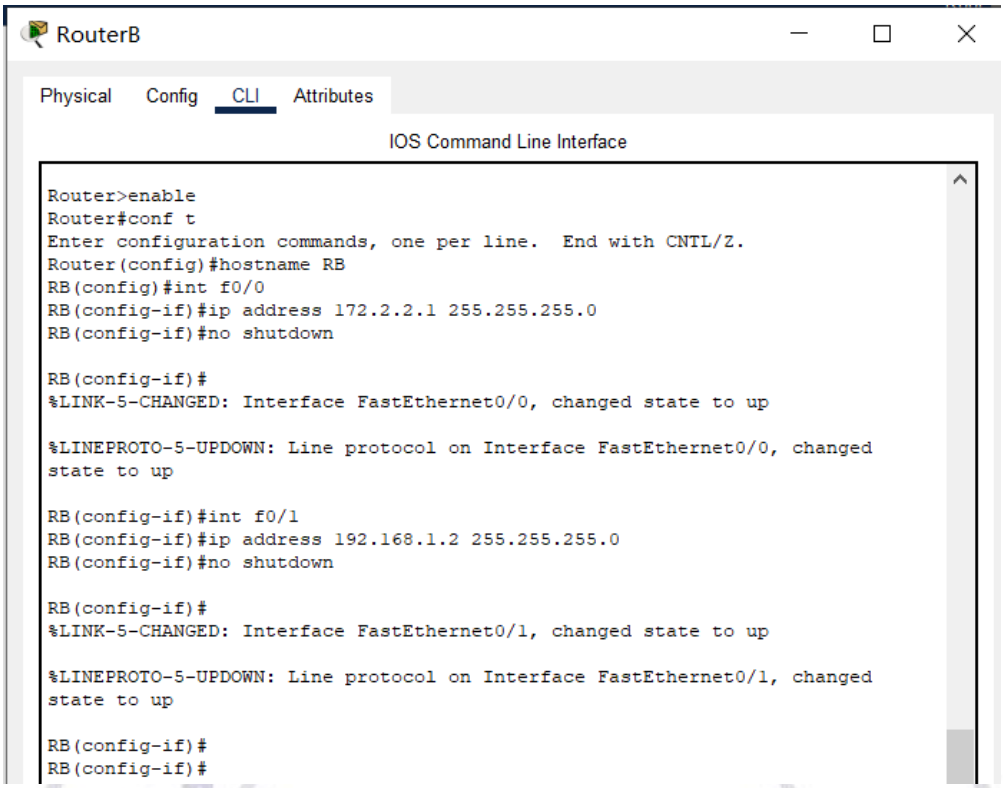
网络拓扑结构图如下

1. 路由器的基本配置

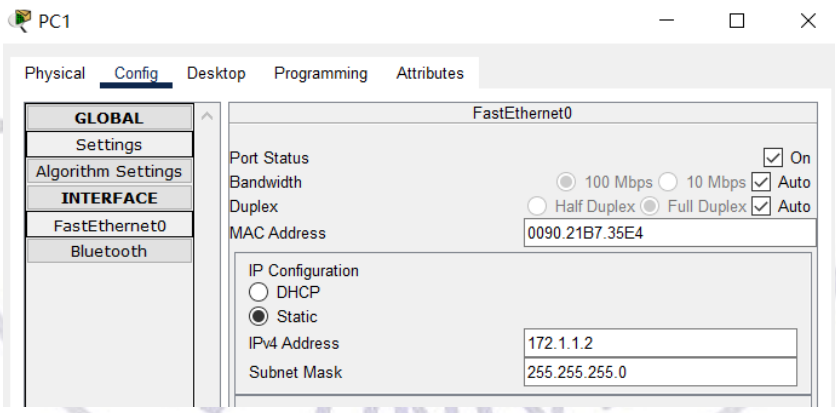
路由器 A 的基本配置

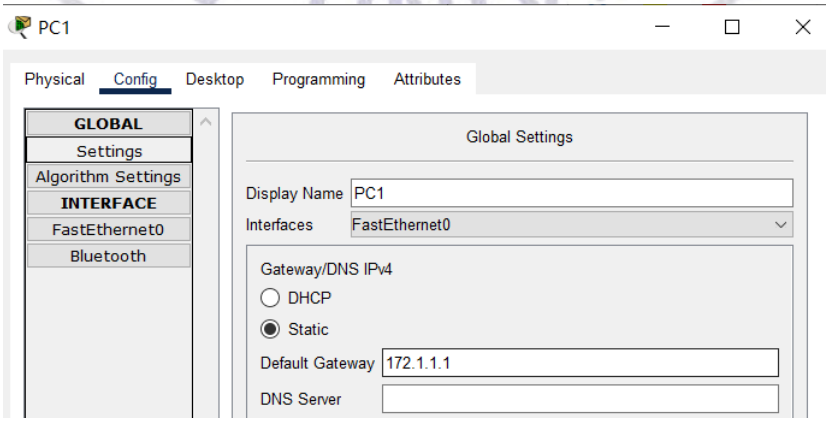


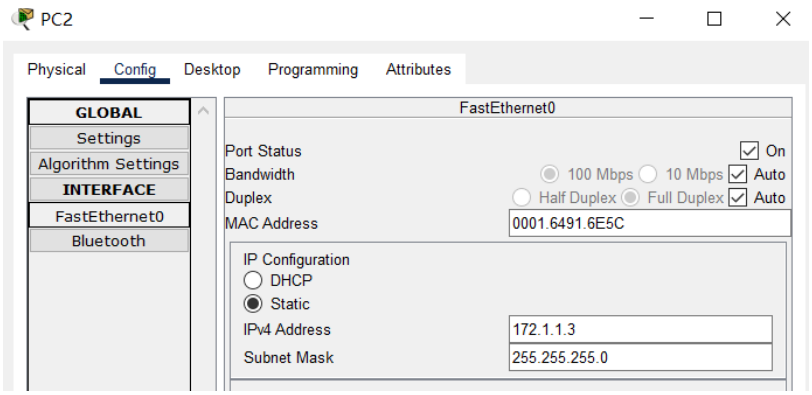
路由器 B 的基本配置

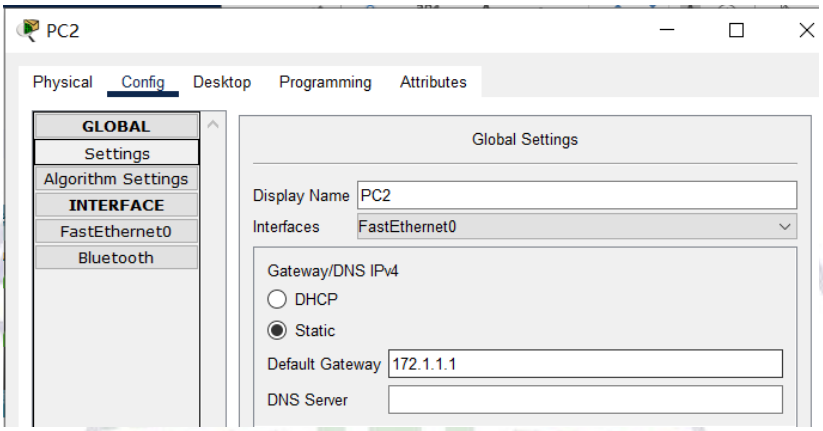


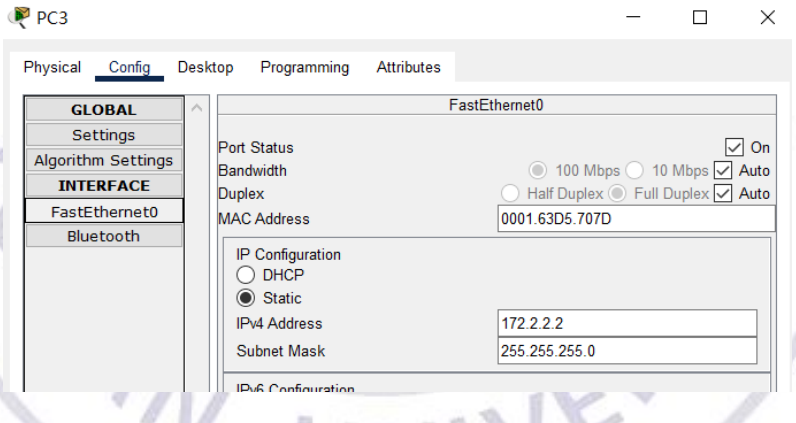
各台 PC 的 IP 及网关配置

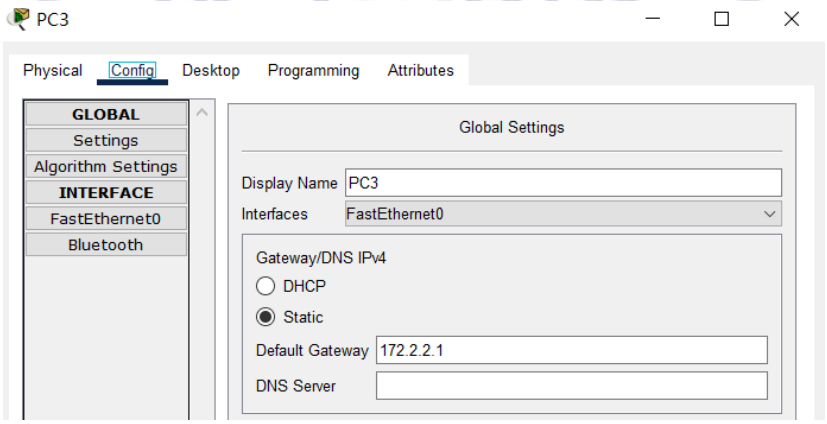


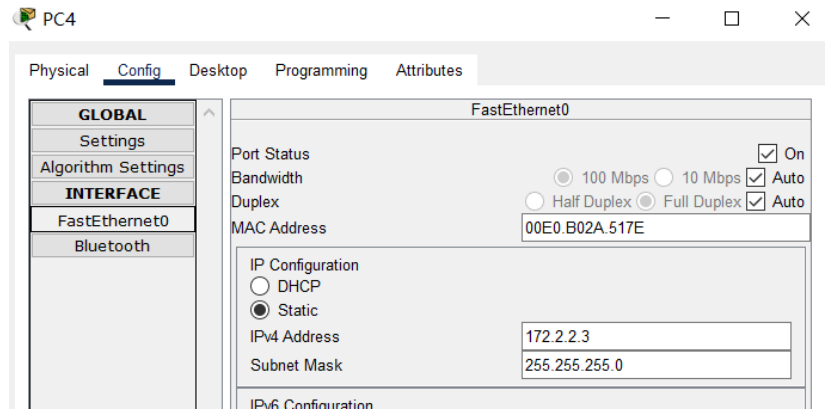


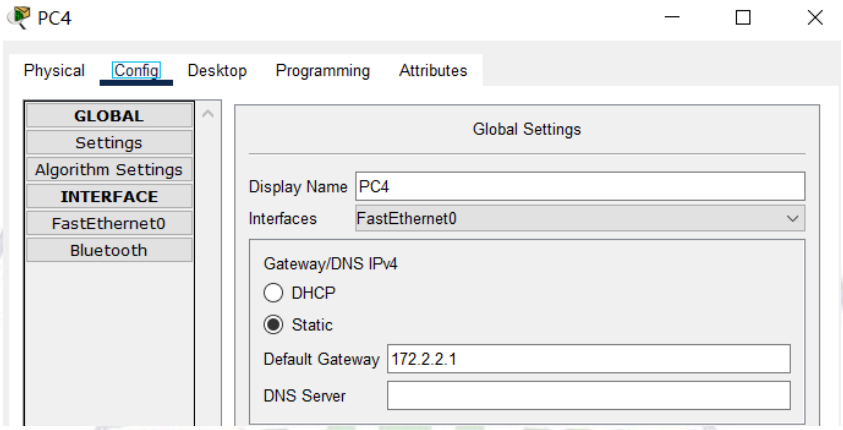

PC2
Physical
Config
Desktop
Programming
Attributes
GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth
FastEthernet0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0001.6491.6E5C
IP Configuration
DHCP
Static
IPv4 Address
172.1.1.3
Subnet Mask
255.255.255.0


PC2
Physical
Config
Desktop
Programming
Attributes
GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth
Global Settings
Display Name
PC2
Interfaces
FastEthernet0
Gateway/DNS IPv4
DHCP
Static
Default Gateway
172.1.1.1
DNS Server

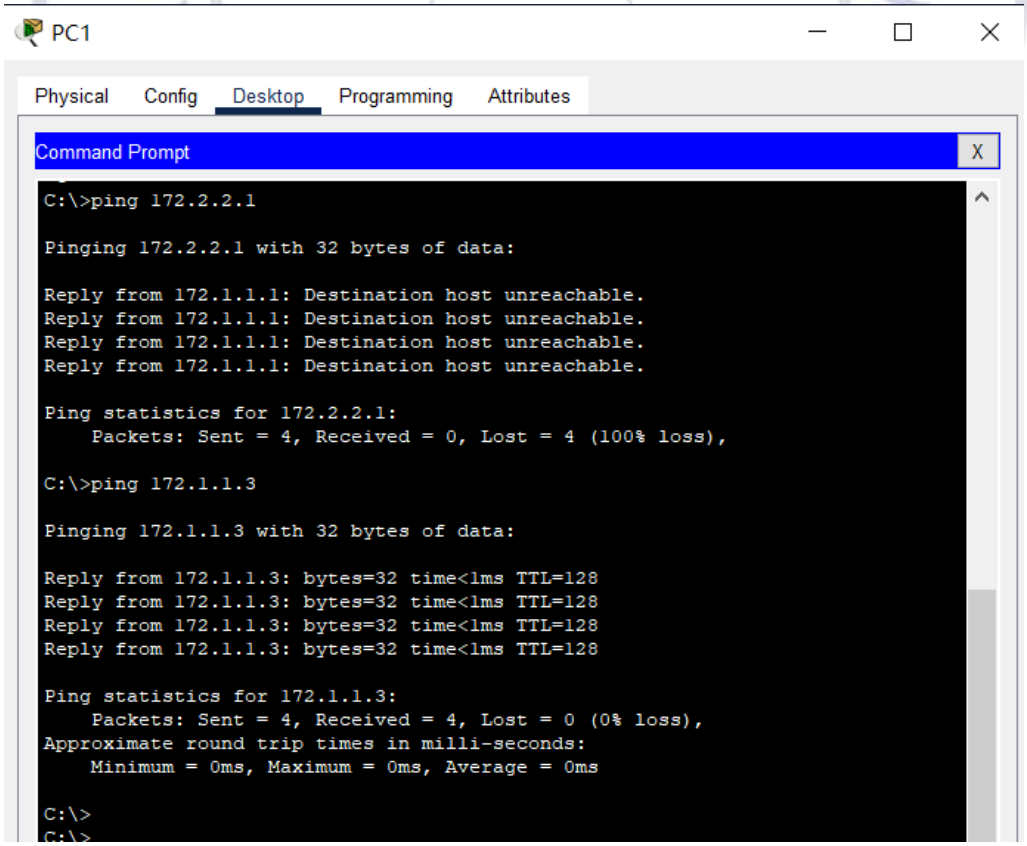

PC3
Physical
Config
Desktop
Programming
Attributes
GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth
FastEthernet0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0001.63D5.707D
IP Configuration
DHCP
Static
IPv4 Address
172.2.2.2
Subnet Mask
255.255.255.0


PC3
Physical
Config
Desktop
Programming
Attributes
GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth
Global Settings
Display Name
PC3
Interfaces
FastEthernet0
Gateway/DNS IPv4
DHCP
Static
Default Gateway
172.2.2.1
DNS Server





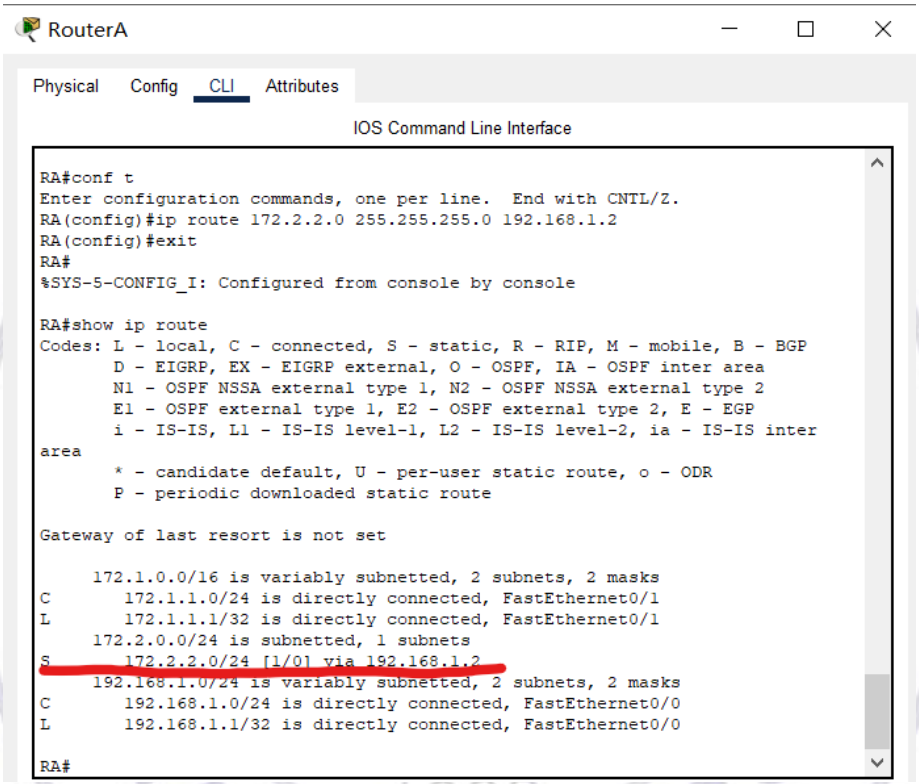
分别 ping 路由器 B 的 f0/0 接口与 PC2，结果如下图：



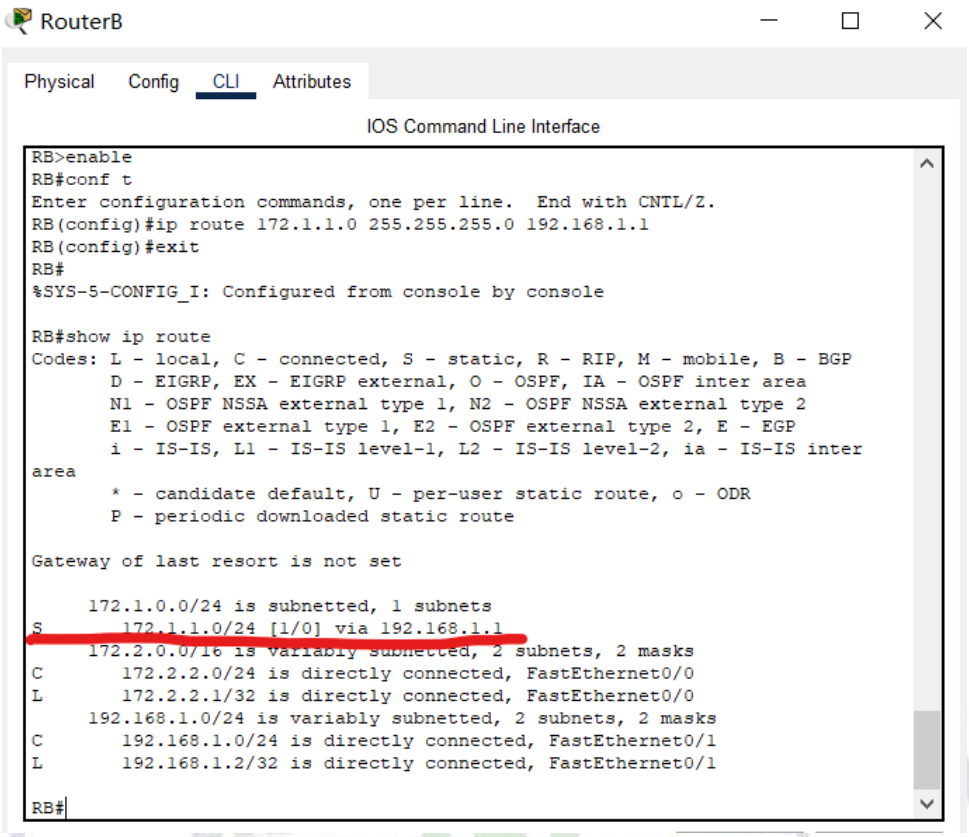
可以发现，PC1 ping 路由器 B 的 f0/0 接口（即 172.2.2.0/24 网段），显示“Destination host unreachable”，说明本网络（172.2.2.0/24 网段）根本没有到目标地址的路由路径。PC1 ping PC2（172.1.1.3）可以成功 ping 通，这是数据是通过交换机 A 直接转发给 PC2 的。

2. 配置静态路由

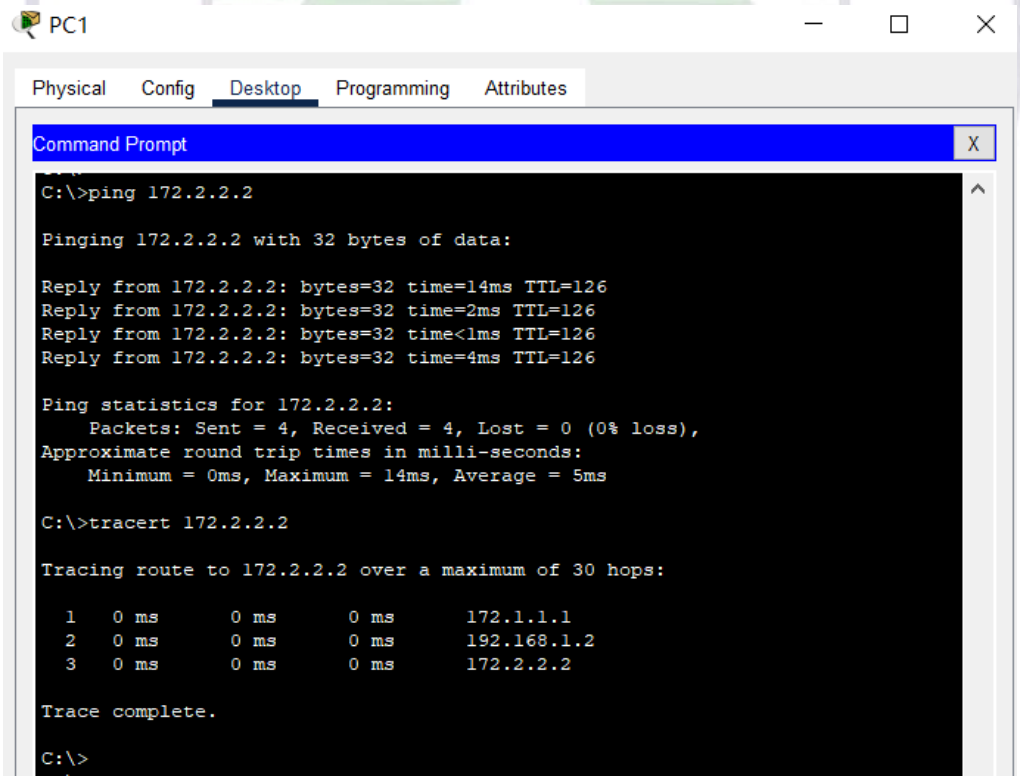
路由器 A 的静态路由配置及路由表，红色部分为手动配置的静态路由



路由器 B 的静态路由配置及路由表，红色部分为手动配置的静态路由



PC1 可以 ping 通 PC3，两个网段是连通的，路由跟踪的结果如下图

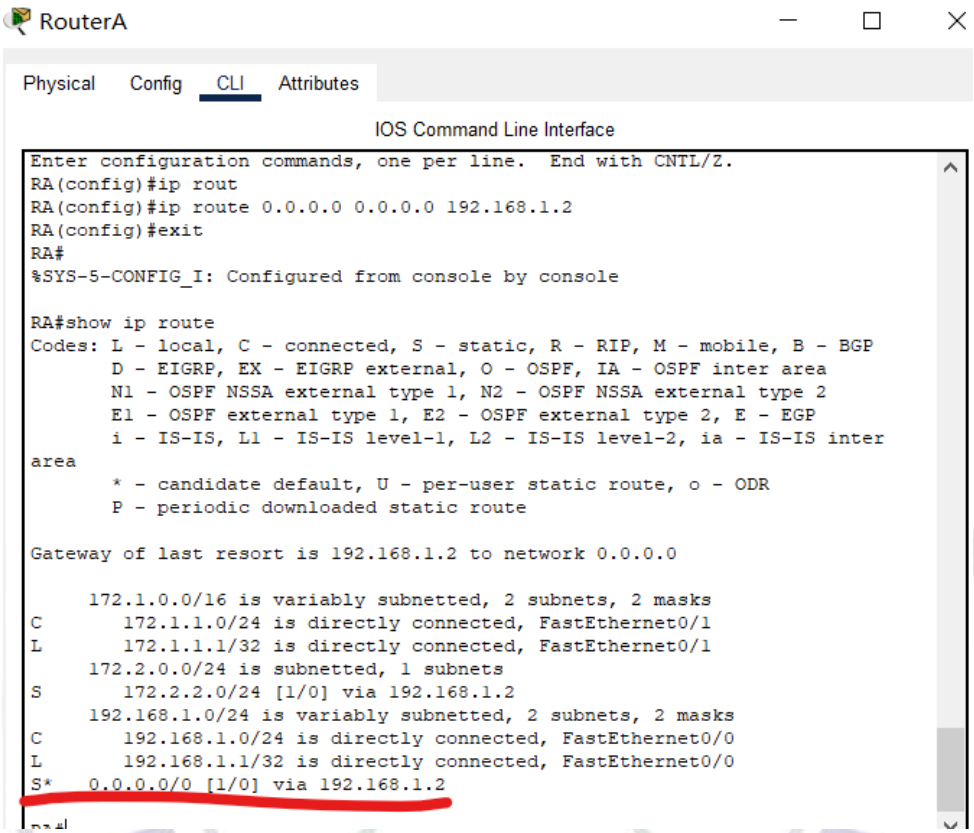


可以发现，路由跟踪跟踪的是每个下一跳的 IP 地址，对于 PC1 来说，下一跳为路由器 A 的 f0/1 接口；对于路由器 A 来说，下一跳为路由器 B 的 f0/1 接

口；对于路由器 B 来说，下一跳为 PC3。

3. 配置路由器的默认路由

将路由器 A 的默认路由设为路由器 B 的 f0/1 接口（红色线标注处）



将路由器 B 的默认路由设为路由器 A 的 f0/0 接口（红色线标注处）

RouterB

Physical Config CLI Attributes

IOS Command Line Interface

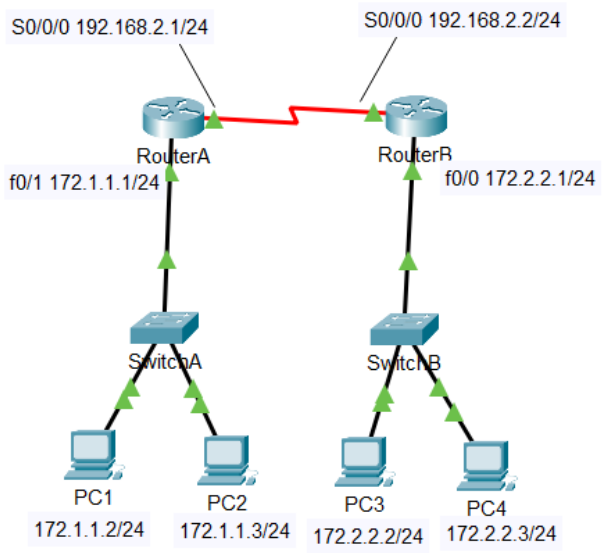
```
RB#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
RB(config)#ip route 0.0.0.0 0.0.0.0 192.168.1.1
RB(config)#exit
RB#
%SYS-5-CONFIG_I: Configured from console by console

RB#show ip route
Codes: L - local, C - connected, S - static, 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 192.168.1.1 to network 0.0.0.0

     172.1.0.0/24 is subnetted, 1 subnets
S       172.1.1.0/24 [1/0] via 192.168.1.1
     172.2.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.2.2.0/24 is directly connected, FastEthernet0/0
L       172.2.2.1/32 is directly connected, FastEthernet0/0
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, FastEthernet0/1
L       192.168.1.2/32 is directly connected, FastEthernet0/1
S*   0.0.0.0/0 [1/0] via 192.168.1.1

RB#
```

六、实验总结及体会

思考题

（1）如果实验拓扑图如图 11-8 所示，应该如何配置才能使得所有 PC 机相互通信？

如下图标注中所示配置接口的 IP

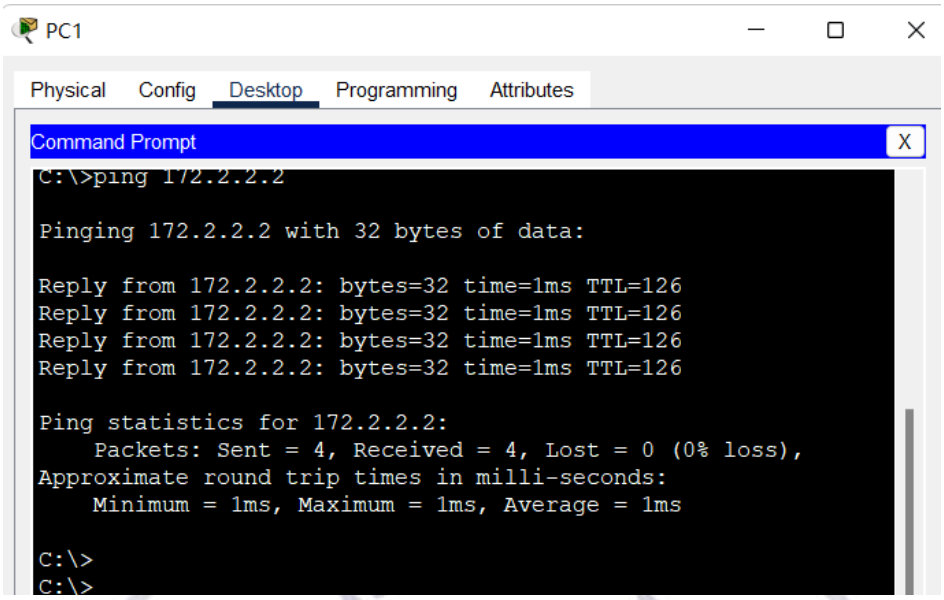


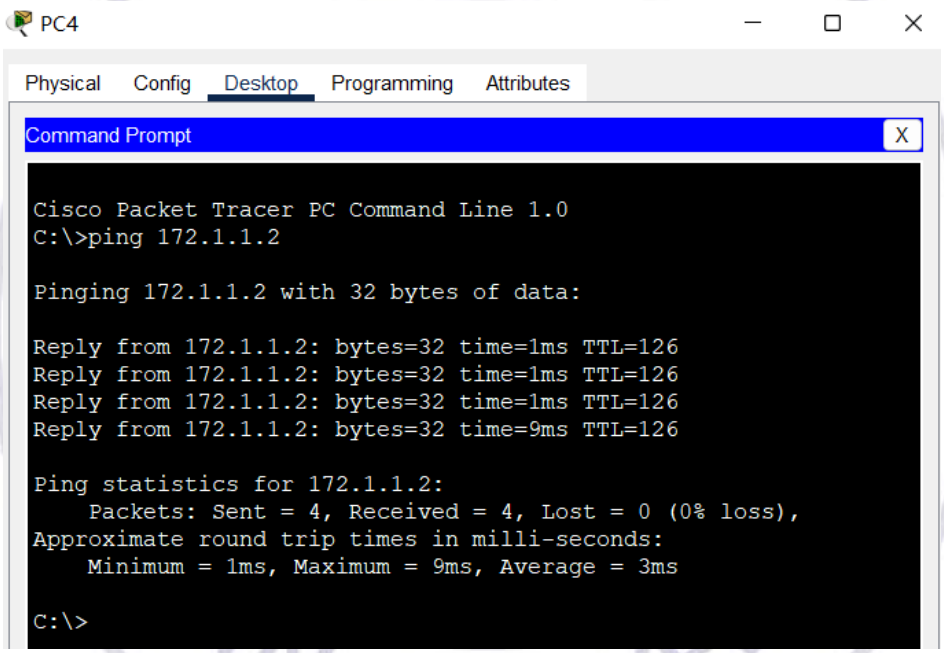
路由器 A 和路由器 B 的路由表如下所示

```
RA>enable
RA#show ip route
Codes: L - local, C - connected, S - static, 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
C       172.1.1.0/24 is directly connected, FastEthernet0/1
L       172.1.1.1/32 is directly connected, FastEthernet0/1
     172.2.0.0/24 is subnetted, 1 subnets
S       172.2.2.0/24 [1/0] via 192.168.2.2
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, Serial0/0/0
L       192.168.2.1/32 is directly connected, Serial0/0/0

RA#
```

```
RB>enable
RB#show ip route
Codes: L - local, C - connected, S - static, 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
S       172.1.1.0/24 [1/0] via 192.168.2.1
     172.2.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.2.2.0/24 is directly connected, FastEthernet0/0
L       172.2.2.1/32 is directly connected, FastEthernet0/0
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, Serial0/0/0
L       192.168.2.2/32 is directly connected, Serial0/0/0

RB#
```

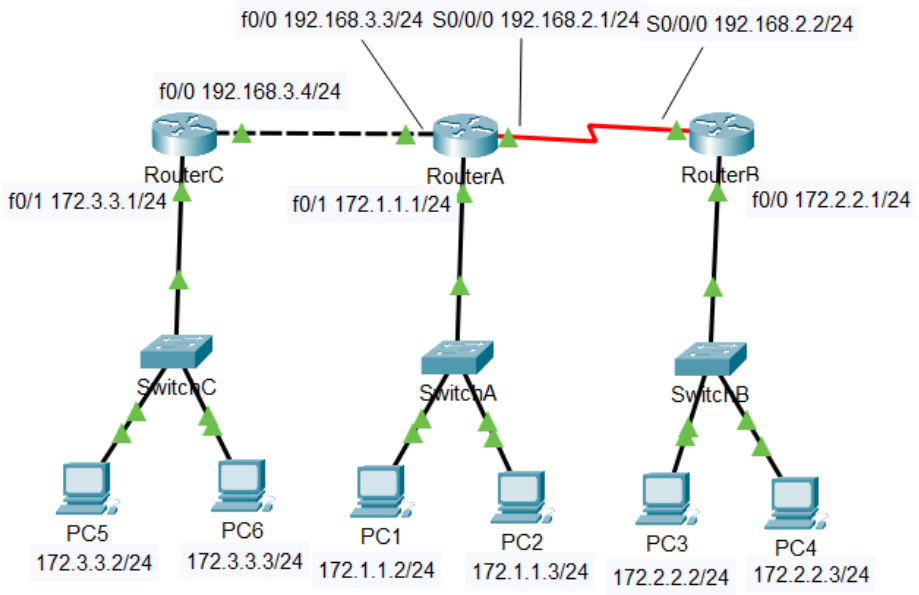
其中，PC1、PC2 的网关设置为 172.1.1.1；PC3、PC4 的网关设置为 172.2.2.1。PC1 ping PC3 与 PC4 ping PC1 的结果如下图所示





（2）如果是由三个路由器组成的拓扑图（如图 11-9 所示），应该如何配置才能让所有的 PC 机相互通信？

如下图标注中所示配置各接口的 IP 地址



路由器 A、路由器 B 和路由器 C 的路由表如下所示

RouterA

Physical Config CLI Attributes

IOS Command Line Interface

```
RA>enable
RA#show ip route
Codes: L - local, C - connected, S - static, 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
C       172.1.1.0/24 is directly connected, FastEthernet0/1
L       172.1.1.1/32 is directly connected, FastEthernet0/1
     172.2.0.0/24 is subnetted, 1 subnets
S       172.2.2.0/24 [1/0] via 192.168.2.2
     172.3.0.0/24 is subnetted, 1 subnets
S       172.3.3.0/24 [1/0] via 192.168.3.4
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, Serial0/0/0
L       192.168.2.1/32 is directly connected, Serial0/0/0
     192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.3.0/24 is directly connected, FastEthernet0/0
 --More--
```

RouterB

Physical Config CLI Attributes

IOS Command Line Interface

```
RB>enable
RB#show ip route
Codes: L - local, C - connected, S - static, 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
S       172.1.1.0/24 [1/0] via 192.168.2.1
     172.2.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.2.2.0/24 is directly connected, FastEthernet0/0
L       172.2.2.1/32 is directly connected, FastEthernet0/0
     172.3.0.0/24 is subnetted, 1 subnets
S       172.3.3.0/24 [1/0] via 192.168.2.1
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, Serial0/0/0
L       192.168.2.2/32 is directly connected, Serial0/0/0

RB#
```

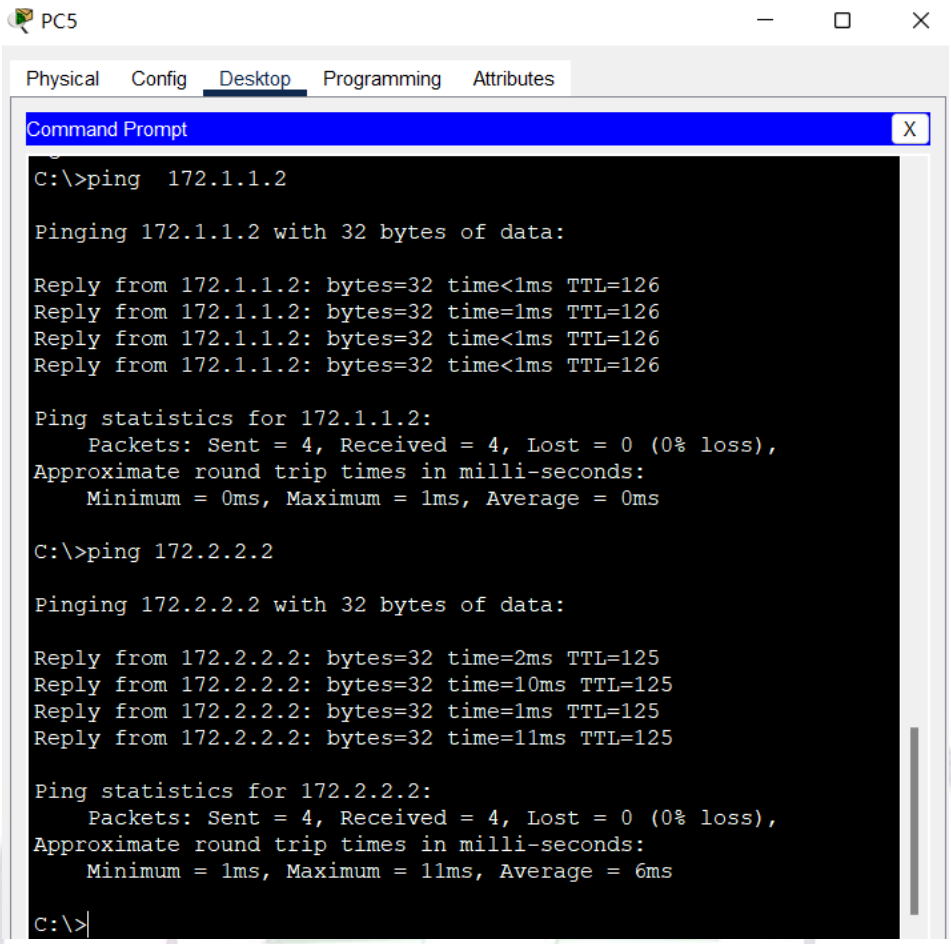
RouterC

Physical Config CLI Attributes

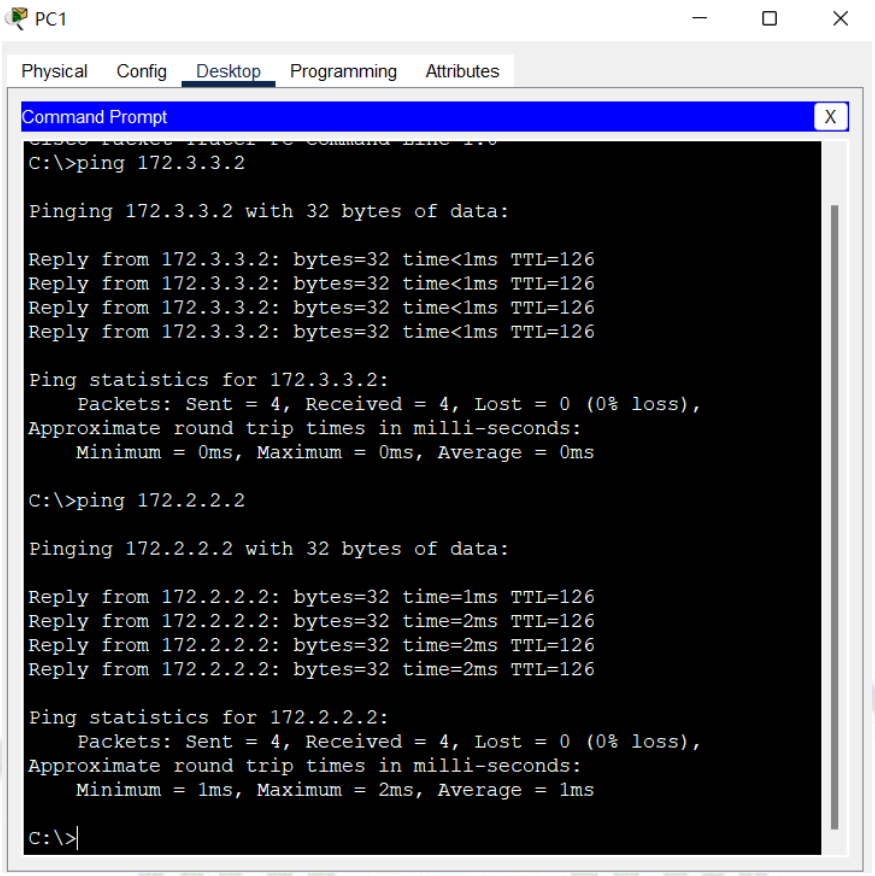
IOS Command Line Interface

```
RC>enable
RC#show ip route
Codes: L - local, C - connected, S - static, 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
S       172.1.1.0/24 [1/0] via 192.168.3.3
     172.2.0.0/24 is subnetted, 1 subnets
S       172.2.2.0/24 [1/0] via 192.168.3.3
     172.3.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.3.3.0/24 is directly connected, FastEthernet0/1
L       172.3.3.1/32 is directly connected, FastEthernet0/1
     192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.3.0/24 is directly connected, FastEthernet0/0
L       192.168.3.4/32 is directly connected, FastEthernet0/0

RC#
RC#
```

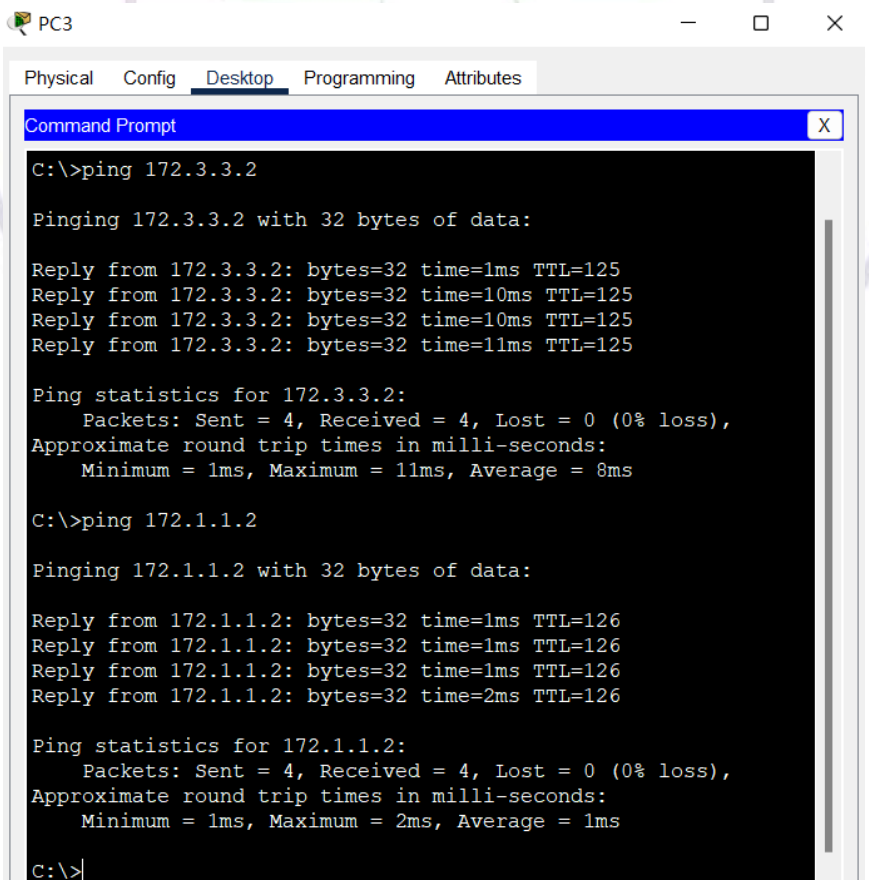
PC5 ping PC1、PC3 的结果如下所示



PC1 ping PC5、PC3 的结果如下所示



PC3 ping PC5、PC1 的结果如下所示



七、教师评语