《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 25 日

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实验名称 开放最短路径优先（OSPF）实验

实验成绩

一、实验目的

（1）掌握路由器的基本配置：设置路由器接口的 IP 地址。

（2）根据以上拓扑划分出的三个网段配置 OSPF 路由，使所有主机都能相互通信。

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 4331 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，路由器相互连接的线路另作为一个网段，并为两个路由器配置接口 IP 地址及 OSPF 协议，

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 OSPF

（1）配置两个路由器的 OSPF 协议，分别向其中添加连接的两个网络的网

络号

（2）测试两个网段之间是否能连通

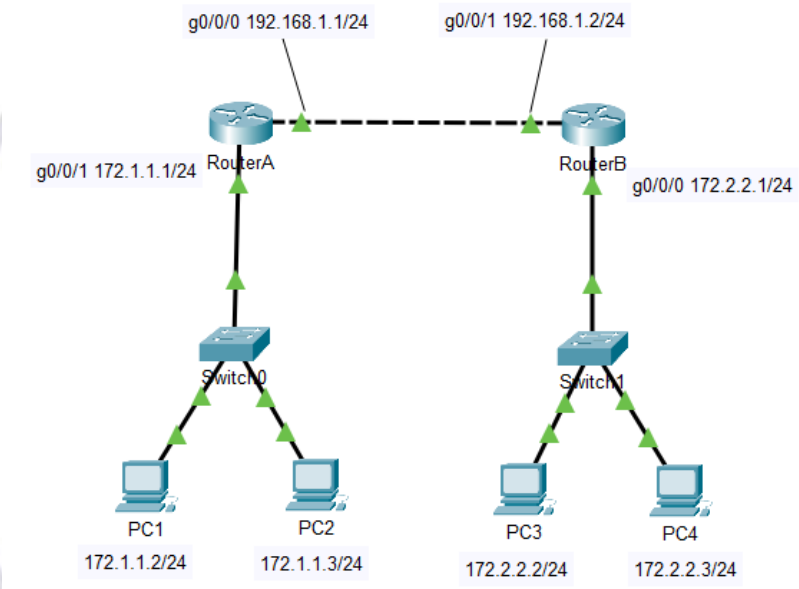
3. 默认路由配置

（1）给路由器 A 配置默认路由

（2）查看两个路由的路由表

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

RouterA

Physical Config CLI Attributes

IOS Command Line Interface

```
Router>enable
Router#conf 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)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

Router(config-if)#int f0/1
Router(config-if)#ip address 172.1.1.1 255.255.255.0
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

Router(config-if)#end
```

路由器 B 的基本配置

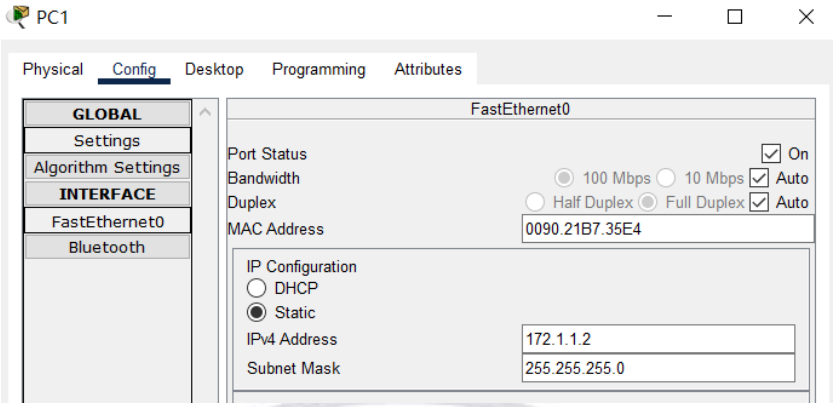
RouterB

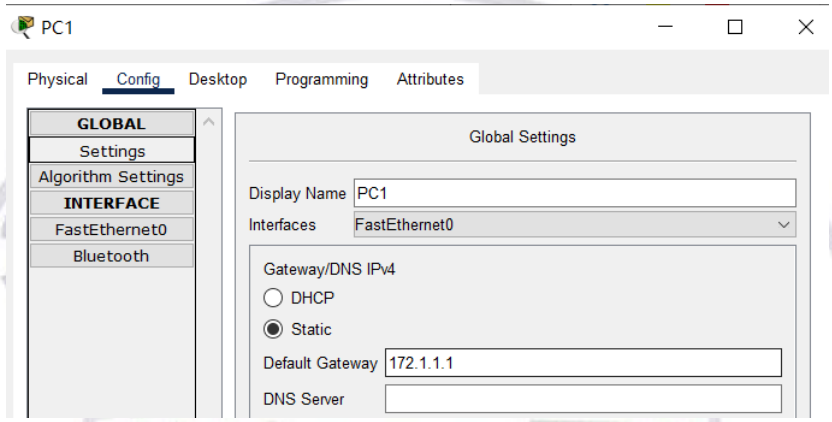
Physical Config CLI Attributes

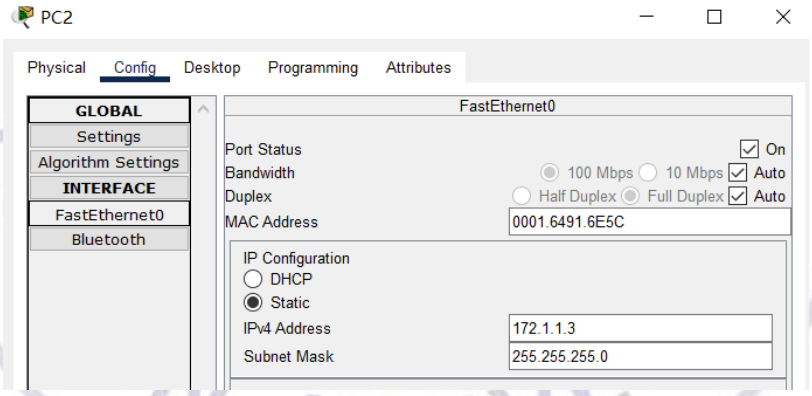
IOS Command Line Interface

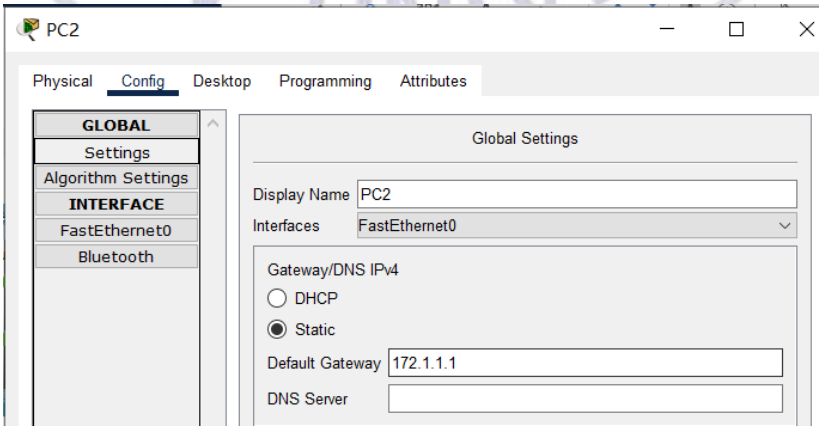
```
Router>enable
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname RB
RB(config)#no ip domain-look
RB(config)#int f0/0
RB(config-if)#ip address 172.2.2.1 255.255.255.0
RB(config-if)#int f0/1
RB(config-if)#ip address 192.168.1.2 255.255.255.0
RB(config-if)#no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

RB(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

RB(config-if)#int f0/0
RB(config-if)#no shutdown

RB(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

RB(config-if)#end
RB#
```

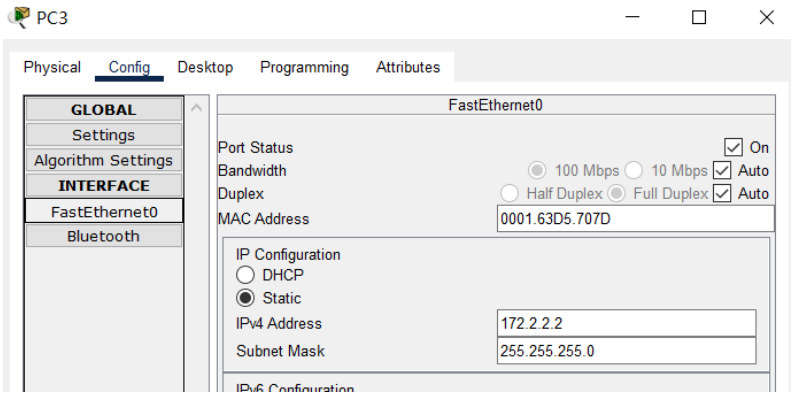
各台 PC 的 IP 及网关配置

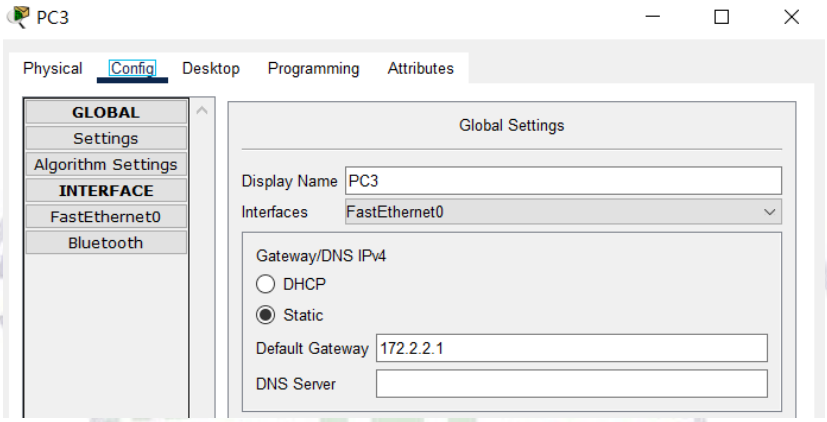


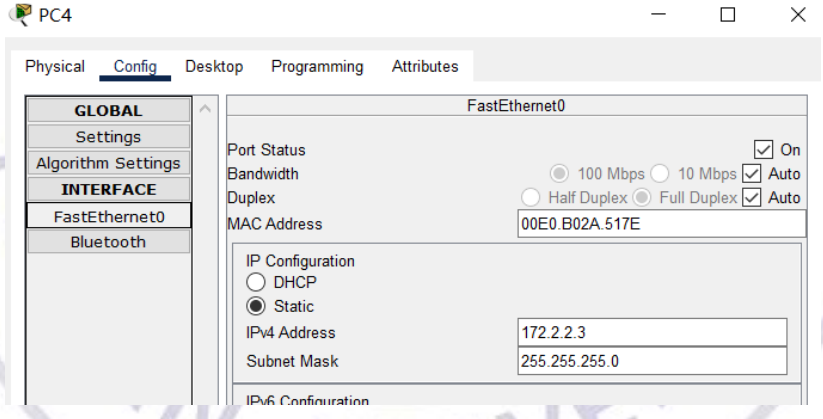


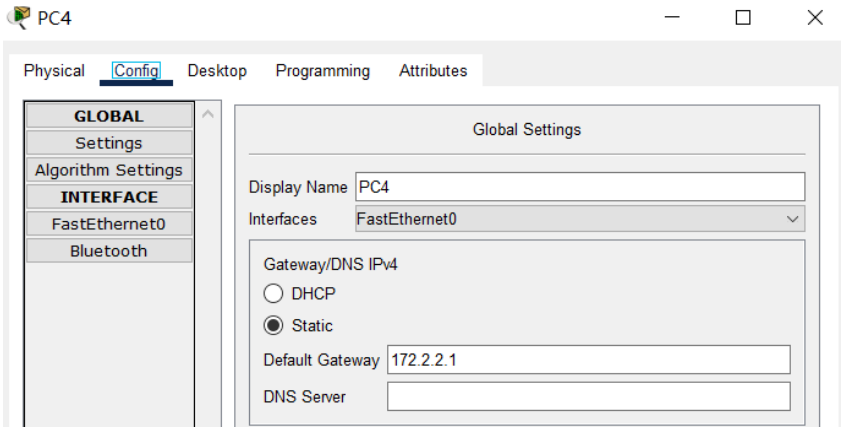





PC3
Physical
Config
Desktop
Programming
Attributes
GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth
FastEthernet0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0001.63D5.707D
IP Configuration
DHCP
Static
IPv4 Address
172.2.2.2
Subnet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

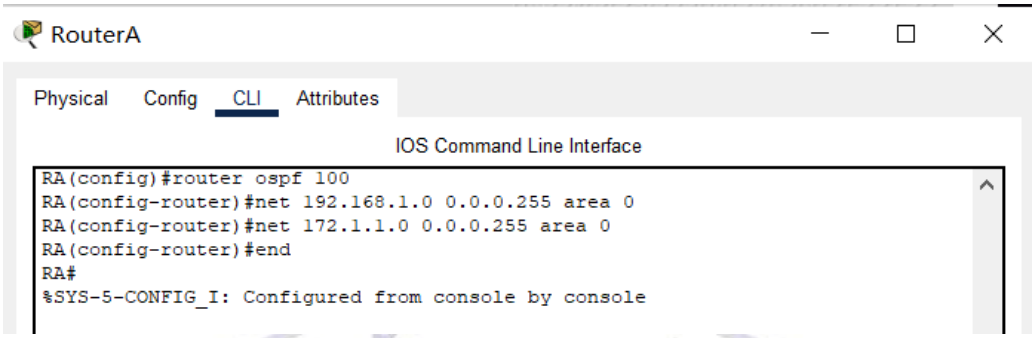

PC3
Physical
Config
Desktop
Programming
Attributes
GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth
Global Settings
Display Name
PC3
Interfaces
FastEthernet0
Gateway/DNS IPv4
DHCP
Static
Default Gateway
172.2.2.1
DNS Server


PC4
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
00E0.B02A.517E
IP Configuration
DHCP
Static
IPv4 Address
172.2.2.3
Subnet Mask
255.255.255.0

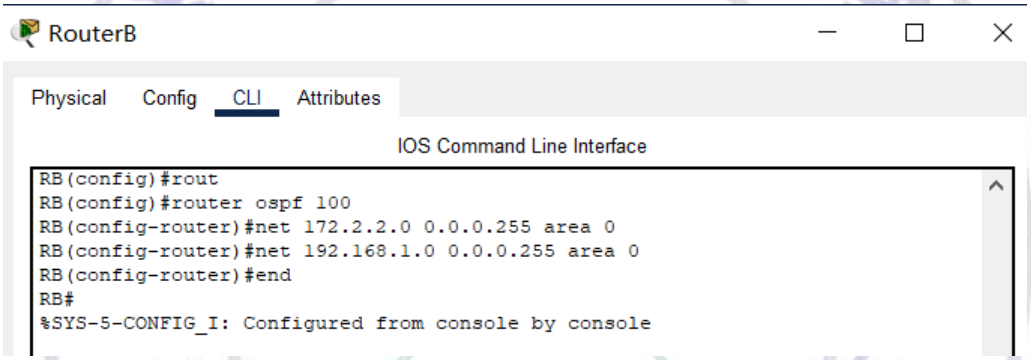

PC4
Physical
Config
Desktop
Programming
Attributes
GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth
Global Settings
Display Name
PC4
Interfaces
FastEthernet0
Gateway/DNS IPv4
DHCP
Static
Default Gateway
172.2.2.1
DNS Server

2. 配置 OSPF

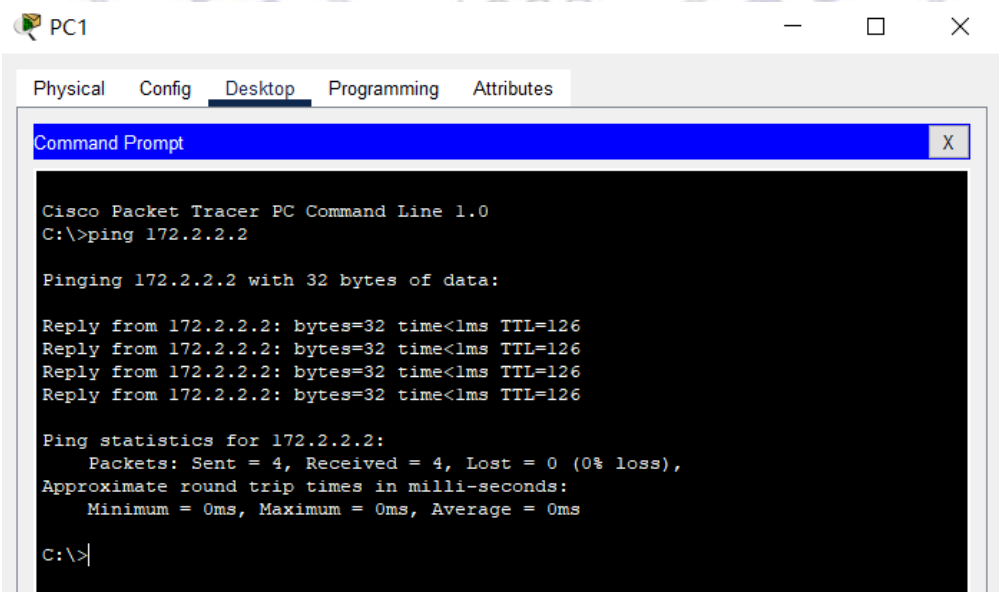
给路由器 A 设置 OSPF 协议，添加 172.1.1.0 与 192.168.1.0 两个网络至路由域 0，即骨干区域



同样配置路由器 B 的 OSPF 协议，添加 172.2.2.0 与 192.168.1.0 两个网络至骨干区域 0

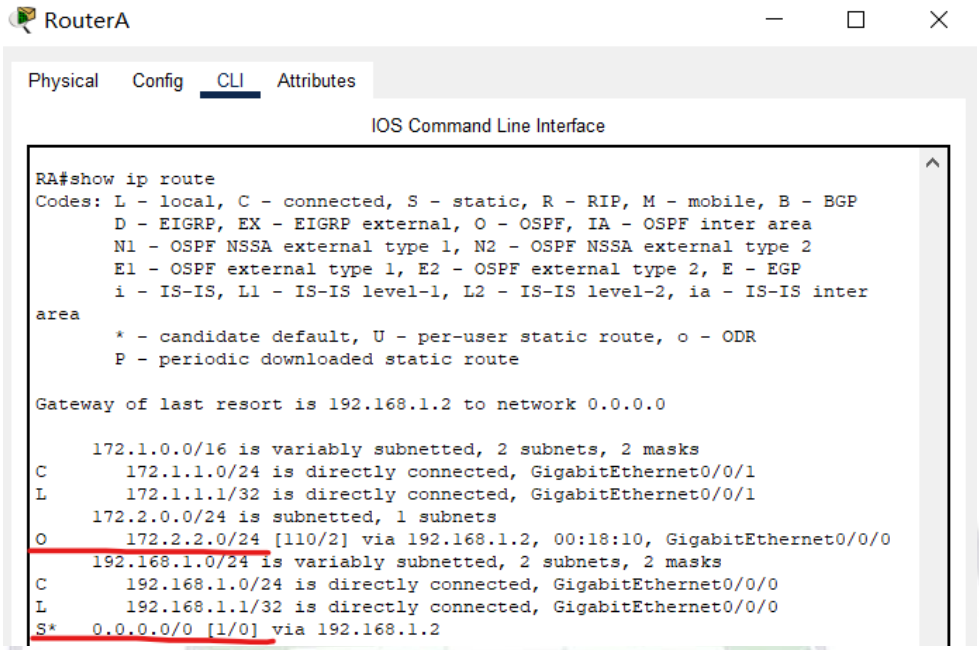


从 PC1 ping PC4 的结果，可以 ping 通

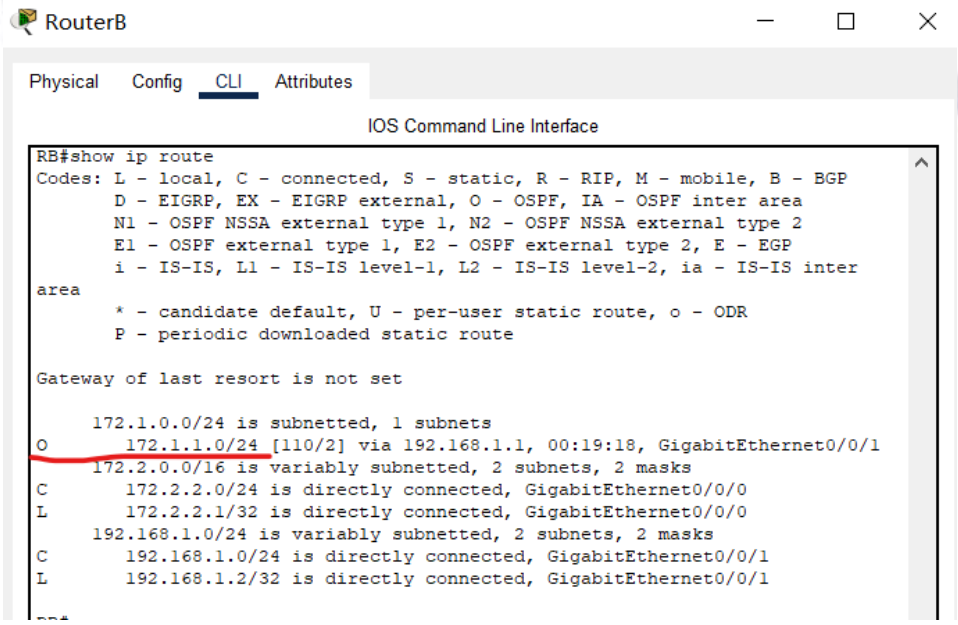


3. 配置路由器的默认路由

将路由器 A 的默认路由设为路由器 B 的 g0/0/1 接口（红色线标注处分别为 OSPF 产生的路由表项和手动配置的默认路由表项）



将路由器 B 的路由表如下（红色标注处为 OSPF 产生的路由表项）

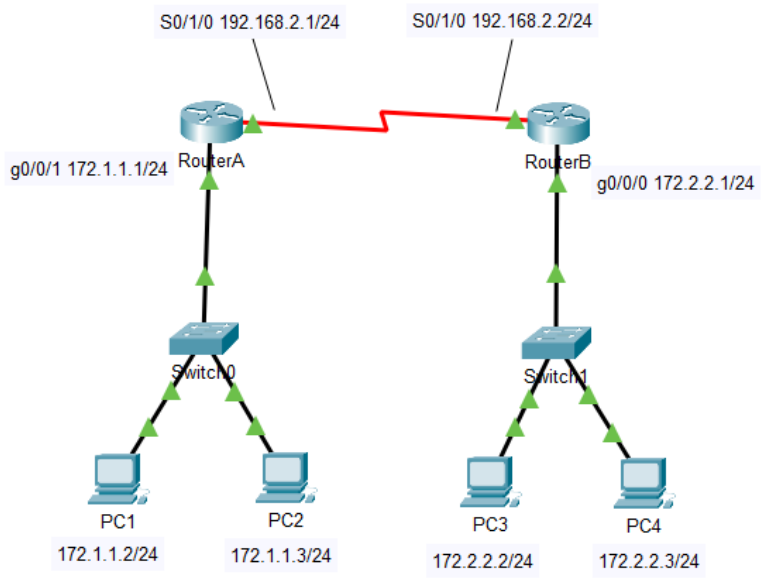


六、实验总结及体会

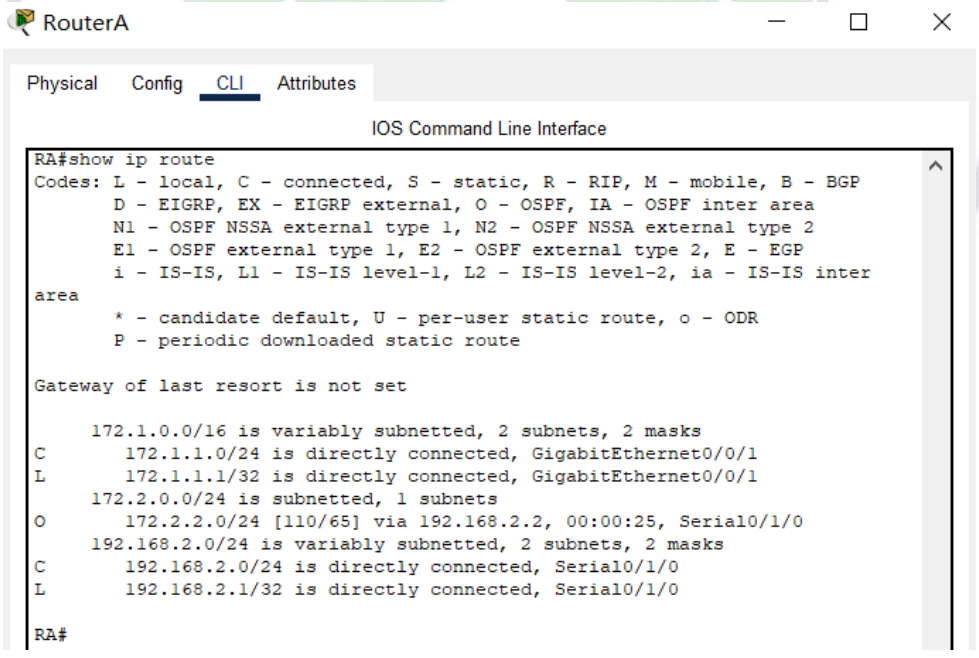
思考题

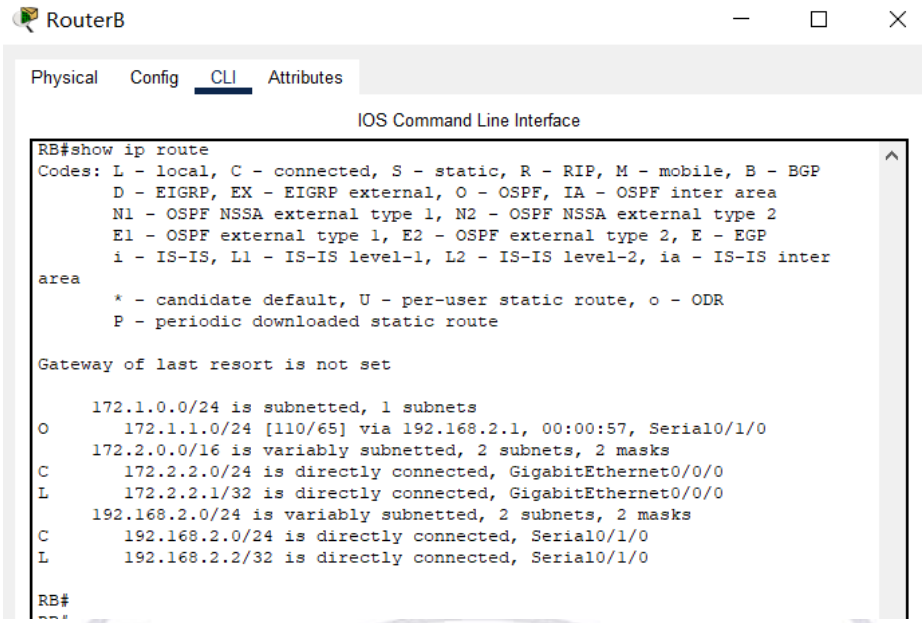
（1）如果实验拓扑图如图 13-8 所示，应该如何配置才能使得所有 PC 机相互通信？

如下图标注中所示配置接口的 IP

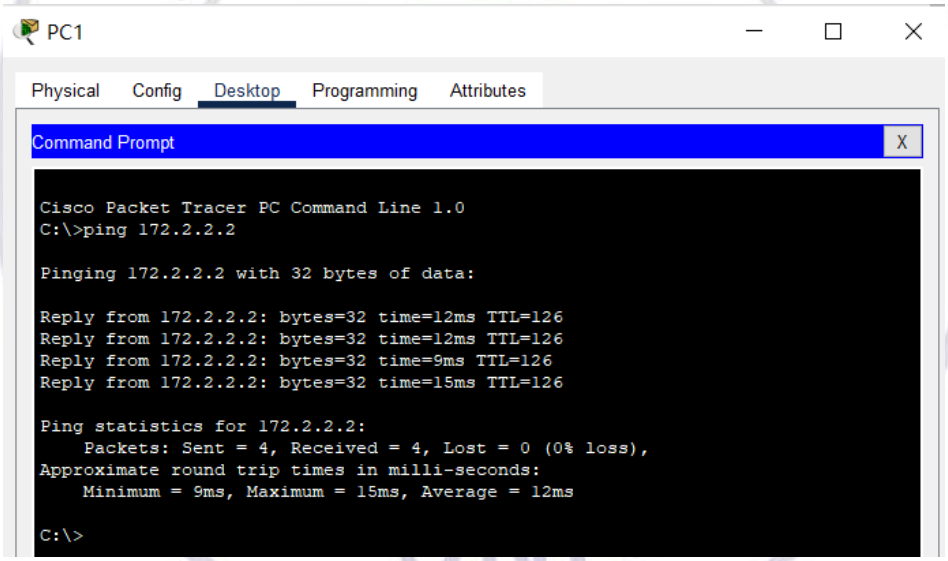


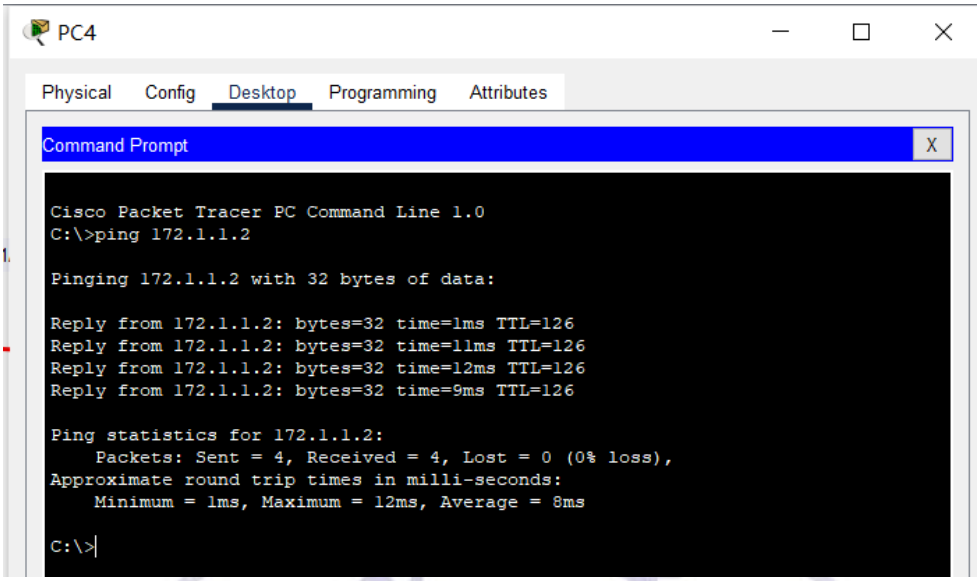
同样配置路由器 A 和路由器 B 的 OSPF，路由器 A 和 B 的路由表如下





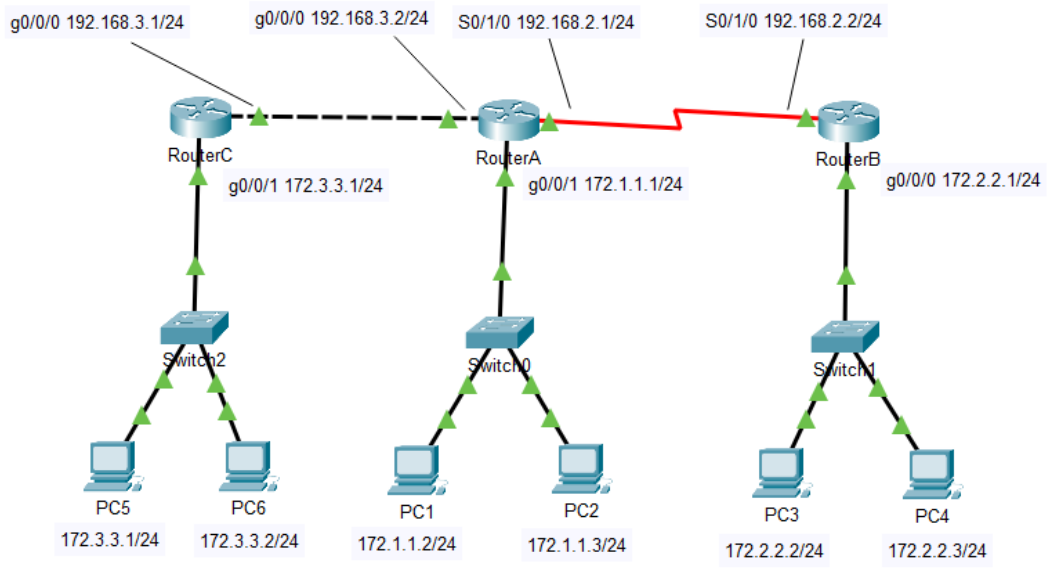
其中，PC1、PC2 的网关设置为 172.1.1.1；PC3、PC4 的网关设置为 172.2.2.1。PC1 ping PC3 与 PC4 ping PC1 的结果如下图所示





（2）如果是由三个路由器组成的拓扑图（如图 13-9 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，给两边的路由器 C 和路由器 B 配置默认路由到路由器 A

RouterA

Physical Config CLI Attributes

IOS Command Line Interface

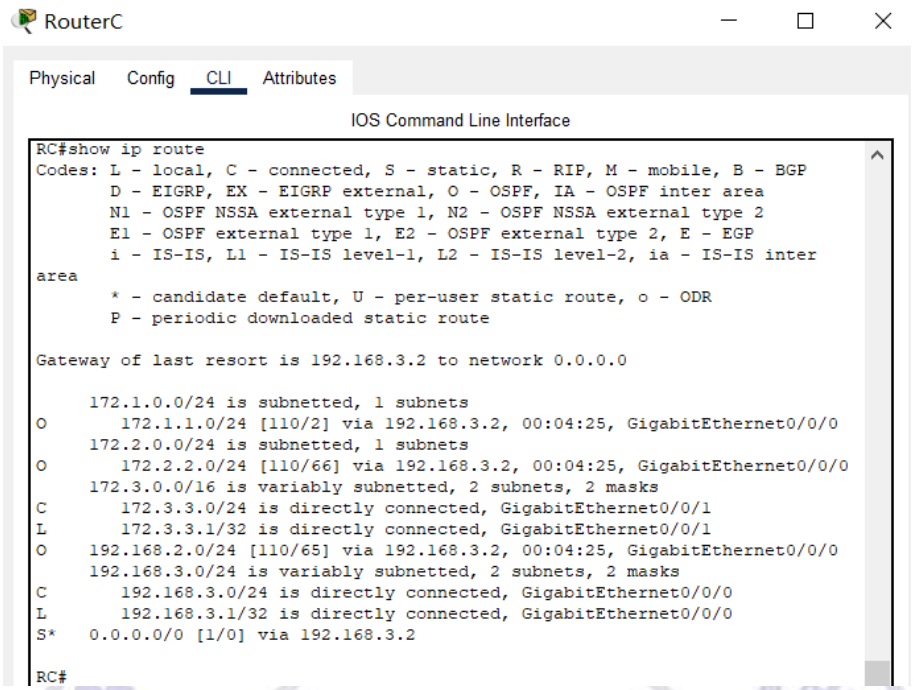
```
RA#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       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, GigabitEthernet0/0/1
L       172.1.1.1/32 is directly connected, GigabitEthernet0/0/1
     172.2.0.0/24 is subnetted, 1 subnets
O       172.2.2.0/24 [110/65] via 192.168.2.2, 00:09:36, Serial0/1/0
     172.3.0.0/24 is subnetted, 1 subnets
O       172.3.3.0/24 [110/2] via 192.168.3.1, 00:03:01, GigabitEthernet0/0/0
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, Serial0/1/0
L       192.168.2.1/32 is directly connected, Serial0/1/0
     192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.3.0/24 is directly connected, GigabitEthernet0/0/0
L       192.168.3.2/32 is directly connected, GigabitEthernet0/0/0

RA#
```

RouterB

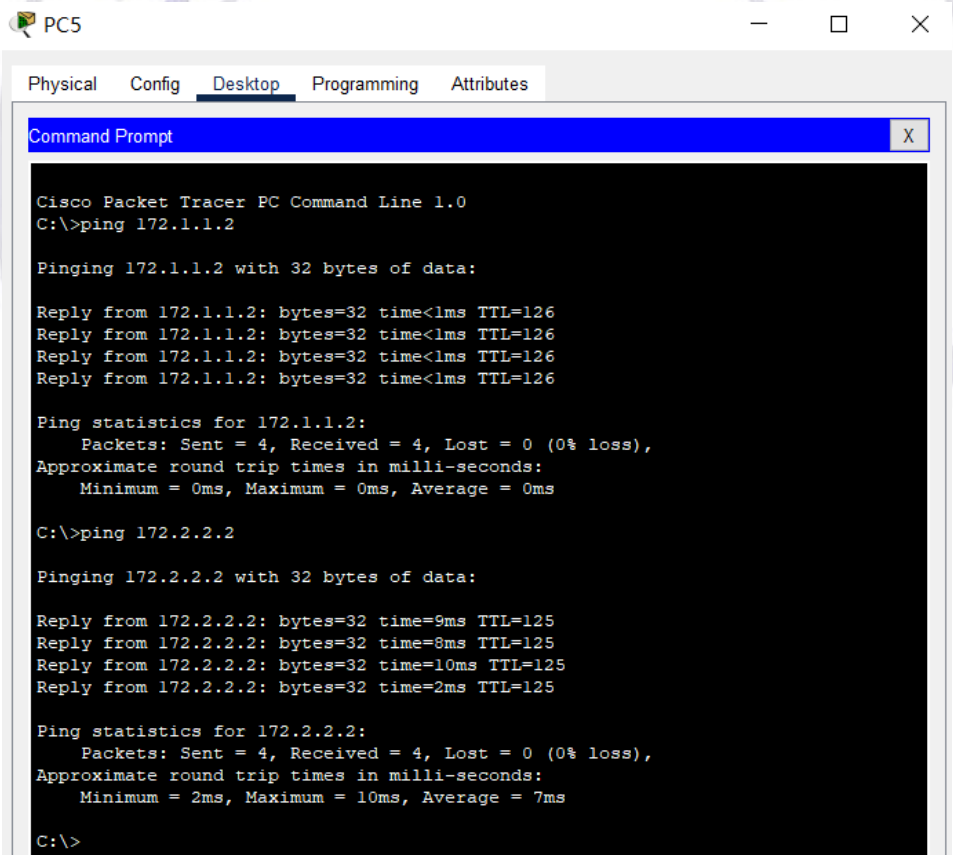
Physical Config CLI Attributes

IOS Command Line Interface

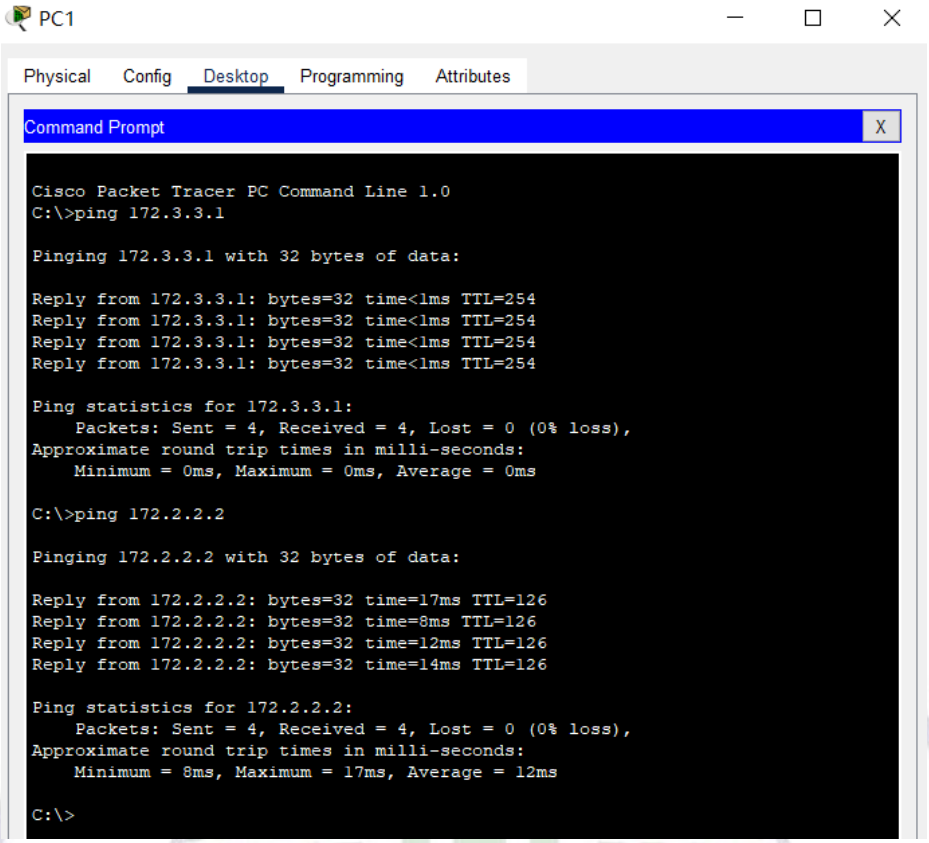
```
RB#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       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 192.168.2.1 to network 0.0.0.0

     172.1.0.0/24 is subnetted, 1 subnets
O       172.1.1.0/24 [110/65] via 192.168.2.1, 00:10:33, Serial0/1/0
     172.2.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.2.2.0/24 is directly connected, GigabitEthernet0/0/0
L       172.2.2.1/32 is directly connected, GigabitEthernet0/0/0
     172.3.0.0/24 is subnetted, 1 subnets
O       172.3.3.0/24 [110/66] via 192.168.2.1, 00:03:48, Serial0/1/0
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, Serial0/1/0
L       192.168.2.2/32 is directly connected, Serial0/1/0
O    192.168.3.0/24 [110/65] via 192.168.2.1, 00:03:58, Serial0/1/0
S*   0.0.0.0/0 [1/0] via 192.168.2.1

RB#
```



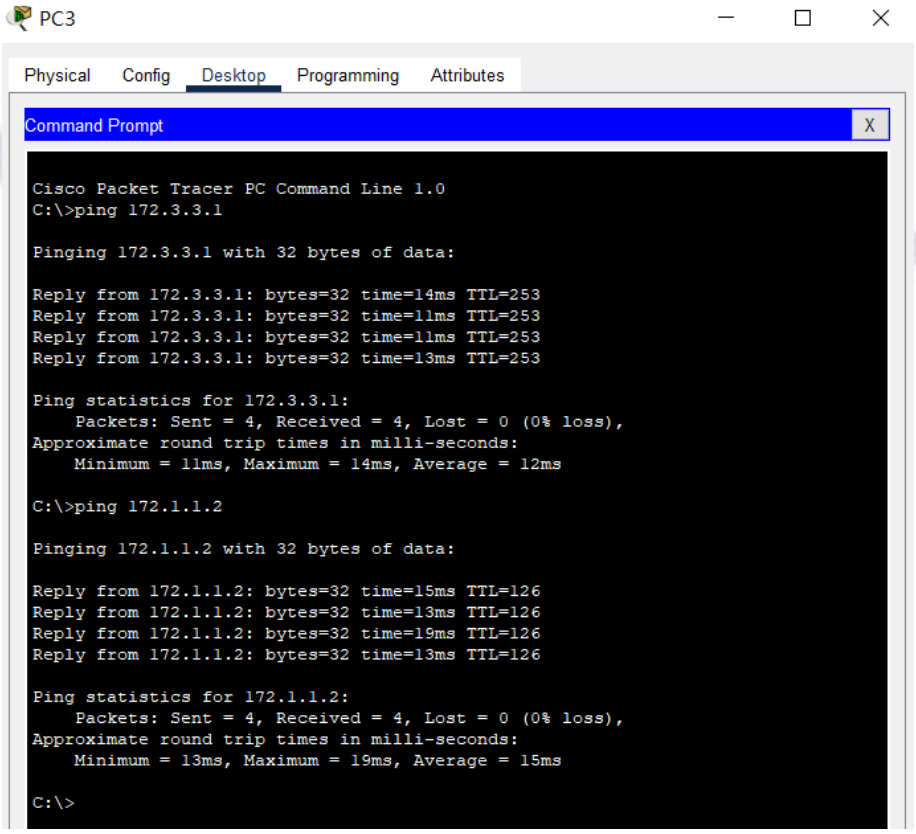
PC5 ping PC1、PC3 的结果如下所示



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