# 实验报告

课程名称: 计算机网络

实验名称:静态路由配置实验

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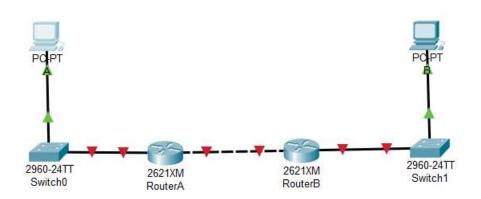
学号: 201710413046

日期: 2020.05.15

- 一、实验目的及要求
- 了解网络路由工作原理。
- 学习静态路由配置方法
- 二、实验设备
- 装有网卡的 PC 机, PC 上安装 Windows 操作系统;
- Cisco 交换机 29XX 系列;
- Cisco 路由器 26XX 系列;
- Console 电缆,以及相应的接口转换器。
- 三、实验步骤和结果

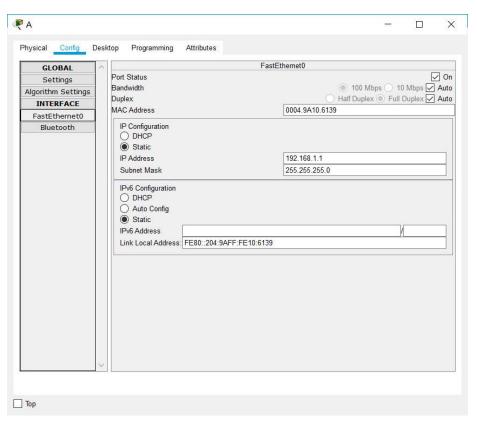
步骤 1: 网关配置

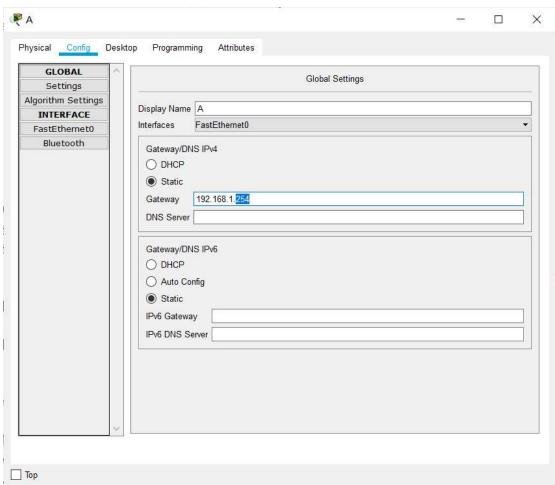
1. 用网线按照静态路由实验拓扑 1 连接工作站 A、路由器 A、路由器 B、工作站



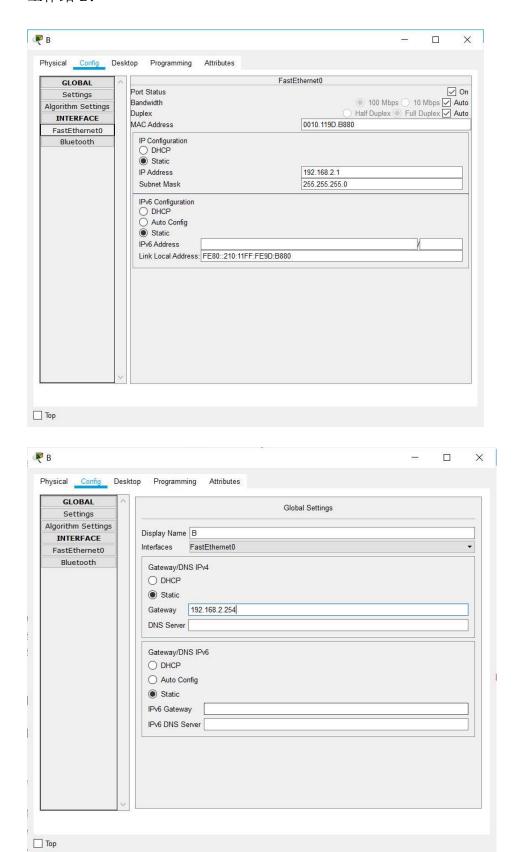
2. 配置工作站 IP 地址、子网掩码、网关地址。

工作站 A:





#### 工作站 B:



3. 配置路由器 A 接口 IP 地址、子网掩码

```
Router(config-if) #interface FastEthernet 0/0
Router(config-if) #ip address 192.168.1.254 255.255.255.0
Router(config-if) #no shutdown
```

#### 4. 配置路由器 B 接口 IP 地址、子网掩码

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 192.168.2.254 255.255.255.0
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
```

#### 5. 检查网络的连通状态

#### 工作站 A

```
C:\>ping 192.168.1.254
Pinging 192.168.1.254 with 32 bytes of data:
Reply from 192.168.1.254: bytes=32 time=1ms TTL=255
Reply from 192.168.1.254: bytes=32 time=2ms TTL=255
Reply from 192.168.1.254: bytes=32 time<1ms TTL=255
Reply from 192.168.1.254: bytes=32 time<1ms TTL=255
Ping statistics for 192.168.1.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 2ms, Average = 0ms
C:\>ping 192.168.2.1
Pinging 192.168.2.1 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 192.168.2.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

#### 工作站 B:

```
C:\>ping 192.168.2.254
Pinging 192.168.2.254 with 32 bytes of data:
Reply from 192.168.2.254: bytes=32 time<1ms TTL=255
Ping statistics for 192.168.2.254:
   Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
   Minimum = Oms, Maximum = Oms, Average = Oms
C:\>ping 192.168.1.1
Pinging 192.168.1.1 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

步骤 2: 静态路由实验拓扑 1 路由配置

1. 检查路由器 A 和路由器 B 的路由信息

```
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
由
           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
器
    Gateway of last resort is not set
Α
        192.168.1.0/24 is directly connected, FastEthernet0/0
    Router#show ip route
路
     Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile,
     B - BGP
           D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter
由
    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
         192.168.2.0/24 is directly connected, FastEthernet0/0
```

2. 配置路由器 A 到路由器 B 之间网络。

路由器 A 的 Fa0/1 端口 IP

```
Router(config) #interface FastEthernet 0/1
Router(config-if) #ip address 192.168.3.1 255.255.255.0
Router(config-if) #no shutdown
Router(config-if) #
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
```

#### 路由器 B 的 Fa0/1 端口 IP

```
Router(config) #interface FastEthernet 0/1
Router(config-if) #ip address 192.168.3.2 255.255.255.0
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
```

3. 检查路由器 A 到路由器 B 之间网络。

#### 路由器 A;

```
Router#ping 192.168.3.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.3.2, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms
```

#### 路由器 B:

```
Router#ping 192.168.3.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.3.1, timeout is 2 seconds:
!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/1/3 ms
```

4. 检查路由器 A 和路由器 B 的路由信息.

#### 路由器 A:

```
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
    192.168.1.0/24 is directly connected, FastEthernet0/0
    192.168.3.0/24 is directly connected, FastEthernet0/1
```

#### 路由器 B:

```
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 192.168.2.0/24 is directly connected, FastEthernet0/0
C 192.168.3.0/24 is directly connected, FastEthernet0/1
```

#### 5. 配置路由器 A 的路由信息。

#### 路由器 A:

Enter configuration commands, one per line. End with CNTL/Z.
Router(config) # ip route 192.168.2.0 255.255.255.0 192.168.3.2
Router(config) #

#### 路由器 B:

Enter configuration commands, one per line. End with CNTL/Z. Router(config)#ip route 192.168.1.0 255.255.255.0 192.168.3.1 Router(config)#!

#### 6. 检查路由器 A 和路由器 B 的路由信息。

#### 路由器 A:

```
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
    192.168.1.0/24 is directly connected, FastEthernet0/0
     192.168.2.0/24 [1/0] via 192.168.3.2
    192.168.3.0/24 is directly connected, FastEthernet0/1
```

#### 路由器 B:

```
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
    192.168.1.0/24 [1/0] via 192.168.3.1
     192.168.2.0/24 is directly connected, FastEthernet0/0
    192.168.3.0/24 is directly connected, FastEthernet0/1
```

#### 7. 检查网络的连通状态

#### 工作站 A:

```
C:\>ping 192.168.2.1

Pinging 192.168.2.1 with 32 bytes of data:

Reply from 192.168.2.1: bytes=32 time<lms TTL=126
Reply from 192.168.2.1: bytes=32 time=1ms TTL=126
Reply from 192.168.2.1: bytes=32 time=13ms TTL=126
Reply from 192.168.2.1: bytes=32 time=12ms TTL=126
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 = 13ms, Average = 6ms
```

#### 工作站 B:

```
C:\>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time<1ms TTL=126

Reply from 192.168.1.1: bytes=32 time=3ms TTL=126

Reply from 192.168.1.1: bytes=32 time=11ms TTL=126

Reply from 192.168.1.1: bytes=32 time=12ms TTL=126

Ping statistics for 192.168.1.1:

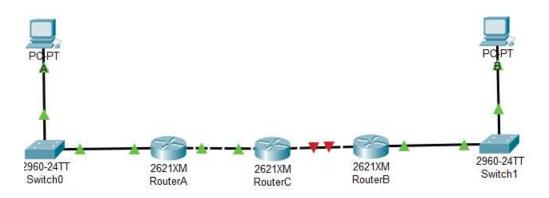
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 12ms, Average = 6ms
```

步骤 3: 静态路由实验拓扑 2 路由配置

#### 1. 进行连接



#### 2. 配置路由器 C

```
Router(config) #interface FastEthernet 0/0
Router(config-if) #ip address 192.168.3.2 255.255.255.0
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

Router(config-if) #interface FastEthernet 0/1
Router(config-if) #in address 192.168.4.1 255.255.255.0
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

配置路由器 B
```

Router(config) #interface fastEthernet 0/1

Router(config-if) #no shutdown

Router(config-if) #ip address 192.168.4.2 255.255.255.0

#### 3. 配置路由表

路由器 A	Router#configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)#ip route 192.168.2.0 255.255.255.0 192.168.3.2 Router(config)#
路由器 B	Router(config-if) #exit Router(config) #ip route 192.168.2.0 255.255.255.0 192.168.4.2 Router(config) #ip route 192.168.1.0 255.255.255.0 192.168.3.1
路由器 C	Router(config) #ip route 192.168.1.0 255.255.255.0 192.168.4.1

#### 4, 验证结果:

```
C:\>ping 192.168.2.1
主机A
                                 Pinging 192.168.2.1 with 32 bytes of data:
                                 Reply from 192.168.2.1: bytes=32 time<1ms TTL=125
                                 Reply from 192.168.2.1: bytes=32 time=14ms TTL=125
                                 Reply from 192.168.2.1: bytes=32 time=14ms TTL=125
Reply from 192.168.2.1: bytes=32 time=13ms TTL=125
                                 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 = 14ms, Average = 10ms
                                 Packet Tracer PC Command Line 1.0
主级 B
                                 C:\>ping 192.168.1.1
                                 Pinging 192.168.1.1 with 32 bytes of data:
                                 Reply from 192.168.1.1: bytes=32 time=1ms TTL=125
                                 Reply from 192.168.1.1: bytes=32 time=10ms TTL=125 Reply from 192.168.1.1: bytes=32 time=13ms TTL=125
                                 Reply from 192.168.1.1: bytes=32 time=13ms TTL=125
                                 Ping statistics for 192.168.1.1:
                                 Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = lms, Maximum = l3ms, Average = 9ms
                                 C:\>
```

四、实验结果分析总结

步骤 1:

```
C:\>ping 192.168.1.254
工作站 A
                    Pinging 192.168.1.254 with 32 bytes of data:
                    Reply from 192.168.1.254: bytes=32 time=1ms TTL=255
                    Reply from 192.168.1.254: bytes=32 time=2ms TTL=255
                    Reply from 192.168.1.254: bytes=32 time<1ms TTL=255
                    Reply from 192.168.1.254: bytes=32 time<1ms TTL=255
                    Ping statistics for 192.168.1.254:
                       Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
                    Approximate round trip times in milli-seconds:
                        Minimum = 0ms, Maximum = 2ms, Average = 0ms
                    C:\>ping 192.168.2.1
                    Pinging 192.168.2.1 with 32 bytes of data:
                    Request timed out.
                    Request timed out.
                    Request timed out.
                    Request timed out.
                    Ping statistics for 192.168.2.1:
                        Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
                    C:\>ping 192.168.2.254
工作站 B
                    Pinging 192.168.2.254 with 32 bytes of data:
                    Reply from 192.168.2.254: bytes=32 time<1ms TTL=255
                    Ping statistics for 192.168.2.254:
                       Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
                    Approximate round trip times in milli-seconds:
                        Minimum = 0ms, Maximum = 0ms, Average = 0ms
                    C:\>ping 192.168.1.1
                    Pinging 192.168.1.1 with 32 bytes of data:
                    Request timed out.
                    Request timed out.
                    Request timed out.
                    Request timed out.
                    Ping statistics for 192.168.1.1:
                        Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

可见网络内部是联通的。

## 步骤 2:

配置前的路由表

```
Router#show ip route
路
    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
由
           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
器
    Gateway of last resort is not set
Α
    C 192.168.1.0/24 is directly connected, FastEthernet0/0
    Router#show ip route
路
    Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile,
    B - BGP
           D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter
由
    area
           N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external
    type 2
器
           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
В
           * - 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
```

## 配置AB之间网络后的路由表

```
Router#show ip route
路
        Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile,
        B - BGP
               D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter
由
        area
              N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external
        type 2
               E1 - OSPF external type 1, E2 - OSPF external type 2, E -
器
               i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia -
        IS-IS inter area
Α
               * - 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
             192.168.3.0/24 is directly connected, FastEthernet0/1
```

```
Router#show ip route
     Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile,
           D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter
由
    area
           N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external
     type 2
           El - OSPF external type 1, E2 - OSPF external type 2, E -
器
     EGP
           i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia -
     IS-IS inter area
В
            * - candidate default, U - per-user static route, o - ODR
           P - periodic downloaded static route
    Gateway of last resort is not set
          192.168.2.0/24 is directly connected, FastEthernet0/0
         192.168.3.0/24 is directly connected, FastEthernet0/1
```

## 全部配置完成的路由表:

```
Router#show ip route
路
        Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile,
               D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter
由
        area
               N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external
        type 2
器
               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
Α
               * - candidate default, U - per-user static route, o - ODR
               P - periodic downloaded static route
        Gateway of last resort is not set
             192.168.1.0/24 is directly connected, FastEthernet0/0
        C
             192.168.2.0/24 [1/0] via 192.168.3.2
            192.168.3.0/24 is directly connected, FastEthernet0/1
    Router#show ip route
    Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile,
           D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter
由
           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 -
В
    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
         192.168.1.0/24 [1/0] via 192.168.3.1
         192.168.2.0/24 is directly connected, FastEthernet0/0
         192.168.3.0/24 is directly connected, FastEthernet0/1
```

## 网络联通状态:

```
C:\>ping 192.168.2.1
工作站 A
                        Pinging 192.168.2.1 with 32 bytes of data:
                        Reply from 192.168.2.1: bytes=32 time<1ms TTL=126
                        Reply from 192.168.2.1: bytes=32 time=lms TTL=126
                        Reply from 192.168.2.1: bytes=32 time=13ms TTL=126
                        Reply from 192.168.2.1: bytes=32 time=12ms TTL=126
                        Ping statistics for 192.168.2.1:
                           Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
                        Approximate round trip times in milli-seconds:
Minimum = Oms, Maximum = 13ms, Average = 6ms
                        C:\>ping 192.168.1.1
工作站 B
                        Pinging 192.168.1.1 with 32 bytes of data:
                        Reply from 192.168.1.1: bytes=32 time<1ms TTL=126
                        Reply from 192.168.1.1: bytes=32 time=3ms TTL=126
                        Reply from 192.168.1.1: bytes=32 time=11ms TTL=126
                        Reply from 192.168.1.1: bytes=32 time=12ms TTL=126
                        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 = 12ms, Average = 6ms
```

可见必须配置路由表之后,主级 A 与主级 B 之间才能联通。要不然路由器不知道改向哪里转发。

### 步骤 3:

## 最终结果

```
主机 A

C:\>ping 192.168.2.1

Pinging 192.168.2.1 with 32 bytes of data:

Reply from 192.168.2.1: bytes=32 time<lms TTL=125
Reply from 192.168.2.1: bytes=32 time=14ms TTL=125
Reply from 192.168.2.1: bytes=32 time=14ms TTL=125
Reply from 192.168.2.1: bytes=32 time=13ms TTL=125
Reply from 192.168.2.1: bytes=32 time=13ms TTL=125

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 = 14ms, Average = 10ms
```

```
主级 B

Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.1

Pinging 192.168.1.1: bytes=32 time=lms TTL=125
Reply from 192.168.1.1: bytes=32 time=l0ms TTL=125
Reply from 192.168.1.1: bytes=32 time=13ms TTL=125
Reply from 192.168.1.1: bytes=32 time=13ms TTL=125
Reply from 192.168.1.1: bytes=32 time=13ms TTL=125

Ping statistics for 192.168.1.1:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:

Minimum = lms, Maximum = 13ms, Average = 9ms

C:\>
```