

# 计算机网络与应用

## 实验二 基于 PacketTracer 的仿真组网

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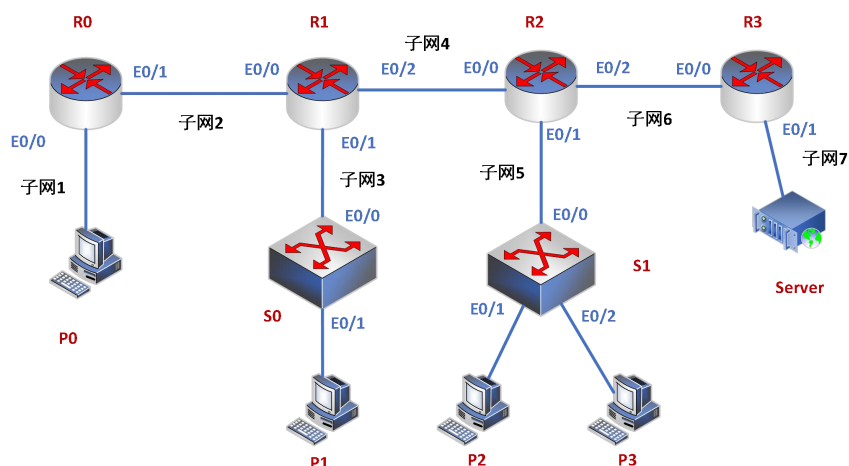
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## 一、实验目的

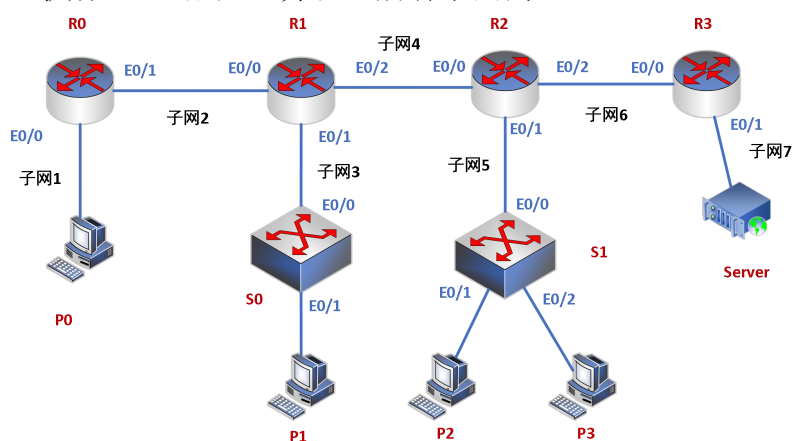
1. 学习掌握 PacketTracer 仿真软件的使用方法。
2. 掌握网络设备的选择、连接线（直通线和交叉线）的使用。
3. 掌握主机的配置方法。
4. 掌握路由器的配置方法（端口和静态路由）。

## 二、实验内容

1. 学习 PacketTracer 基本操作。
2. 根据指定拓扑进行组网，保证网络的连通性。



3. 附加实验: VLAN 配置, 使 PC2 和 PC3 分别接入不同的子网(总子网数为 8), S1 执行 VLAN 配置, 并验证所有子网的互通。

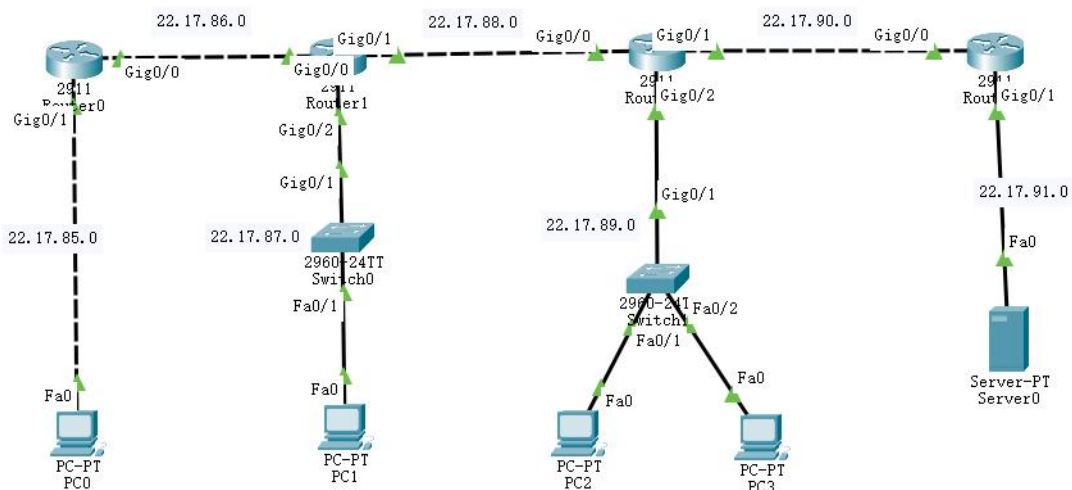


### 三、实验过程（含解析）

（包含设计图、所有主机和路由器的配置截图（show run），以及各设备间的连通性测试截图（ping，对于服务器开启 http 服务，主机通过浏览器可以访问）

#### 实验 1

##### 设计图



路由器与主机配置图：

路由器 R0：

两个接口的 IP 设置：

Router0

PhysicalConfigCLIAttributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0

GigabitEthernet0/1

GigabitEthernet0/2

GigabitEthernet0/0

Port Status

On

Bandwidth

1000 Mbps

Duplex

Full Duplex

MAC Address

0010.118C.8501

IP Configuration

IPv4 Address

22.17.86.1

Subnet Mask

255.255.255.0

Tx Ring Limit

10

Router0

PhysicalConfigCLIAttributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0

GigabitEthernet0/1

GigabitEthernet0/2

GigabitEthernet0/1

Port Status

On

Bandwidth

100 Mbps

Duplex

Full Duplex

MAC Address

0010.118C.8502

IP Configuration

IPv4 Address

22.17.85.1

Subnet Mask

255.255.255.0

Tx Ring Limit

10

路由器 IP 跳转设置：

Network Address
22.17.87.0/24 via 22.17.86.2
22.17.88.0/24 via 22.17.86.2
22.17.89.0/24 via 22.17.86.2
22.17.90.0/24 via 22.17.86.2
22.17.91.0/24 via 22.17.86.2

路由器 R1:

三个接口的 IP 设置:

The image displays three sequential screenshots of the 'Router1' configuration window, specifically the 'Config' tab. Each screenshot shows the configuration for a different Ethernet interface. The left sidebar contains a tree view with categories: GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under the INTERFACE category, the specific interface being configured is highlighted. The main configuration area on the right includes fields for Port Status, Bandwidth, Duplex, MAC Address, IP Configuration (IPv4 Address and Subnet Mask), and Tx Ring Limit.

**Screenshot 1: GigabitEthernet0/0**

Field	Value
Port Status	<input checked="" type="checkbox"/> On
Bandwidth	<input checked="" type="radio"/> 1000 Mbps <input type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto
Duplex	<input type="radio"/> Half Duplex <input checked="" type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto
MAC Address	000A.F350.5401
IPv4 Address	22.17.86.2
Subnet Mask	255.255.255.0
Tx Ring Limit	10

**Screenshot 2: GigabitEthernet0/1**

Field	Value
Port Status	<input checked="" type="checkbox"/> On
Bandwidth	<input checked="" type="radio"/> 1000 Mbps <input type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto
Duplex	<input type="radio"/> Half Duplex <input checked="" type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto
MAC Address	000A.F350.5402
IPv4 Address	22.17.88.1
Subnet Mask	255.255.255.0
Tx Ring Limit	10

**Screenshot 3: GigabitEthernet0/2**

Field	Value
Port Status	<input checked="" type="checkbox"/> On
Bandwidth	<input checked="" type="radio"/> 1000 Mbps <input type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto
Duplex	<input type="radio"/> Half Duplex <input checked="" type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto
MAC Address	000A.F350.5403
IPv4 Address	22.17.87.1
Subnet Mask	255.255.255.0
Tx Ring Limit	10

## 路由器 IP 跳转设置：

Network Address
22.17.85.0/24 via 22.17.86.1
22.17.89.0/24 via 22.17.88.2
22.17.90.0/24 via 22.17.88.2
22.17.91.0/24 via 22.17.88.2

## 路由器 R2：

### 三个接口的 IP 设置：

Router2

Physical **Config** CLI Attributes

**GLOBAL**

- Settings
- Algorithm Settings
- ROUTING**
- Static
- RIP
- SWITCHING**
- VLAN Database
- INTERFACE**
- GigabitEthernet0/0
- GigabitEthernet0/1
- GigabitEthernet0/2

**GigabitEthernet0/0**

Port Status ☒ On

Bandwidth ☒ 1000 Mbps ☐ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0001.C77C.6101

IP Configuration

IPv4 Address 22.17.88.2

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Router2

Physical **Config** CLI Attributes

**GLOBAL**

- Settings
- Algorithm Settings
- ROUTING**
- Static
- RIP
- SWITCHING**
- VLAN Database
- INTERFACE**
- GigabitEthernet0/0
- GigabitEthernet0/1**
- GigabitEthernet0/2

**GigabitEthernet0/1**

Port Status ☒ On

Bandwidth ☒ 1000 Mbps ☐ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

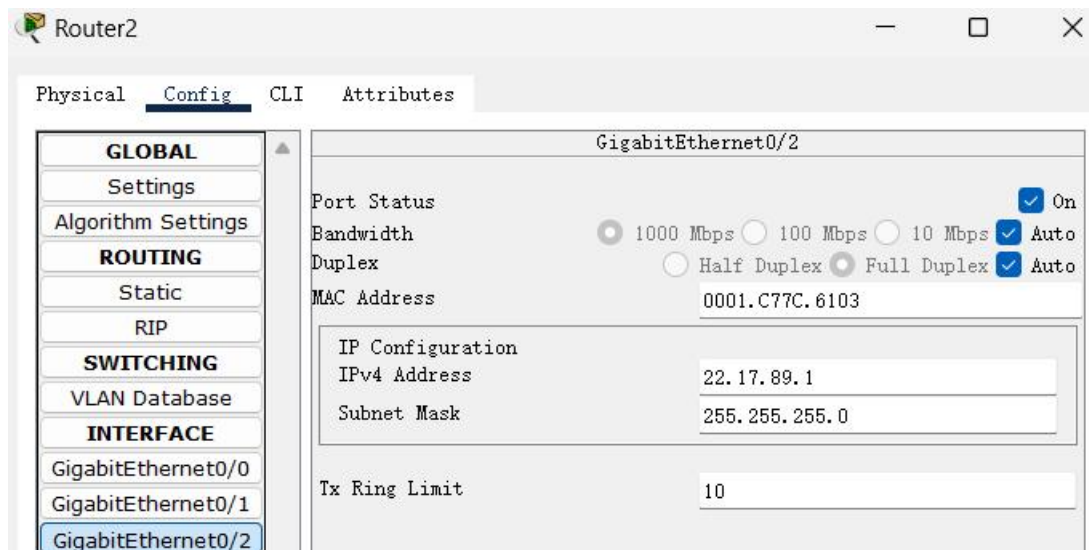
MAC Address 0001.C77C.6102

IP Configuration

IPv4 Address 22.17.90.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10

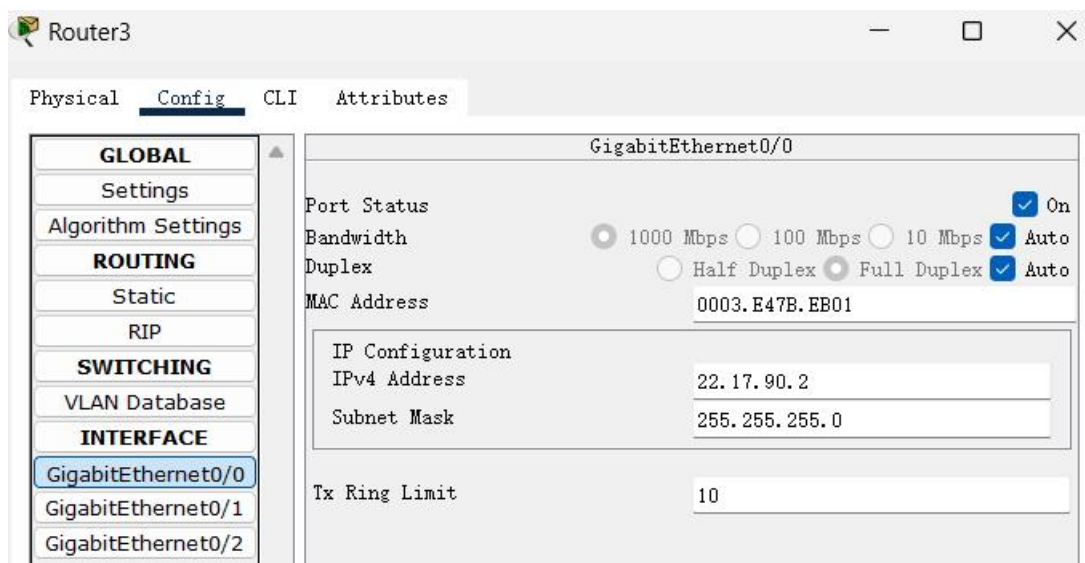


路由器 IP 跳转设置:

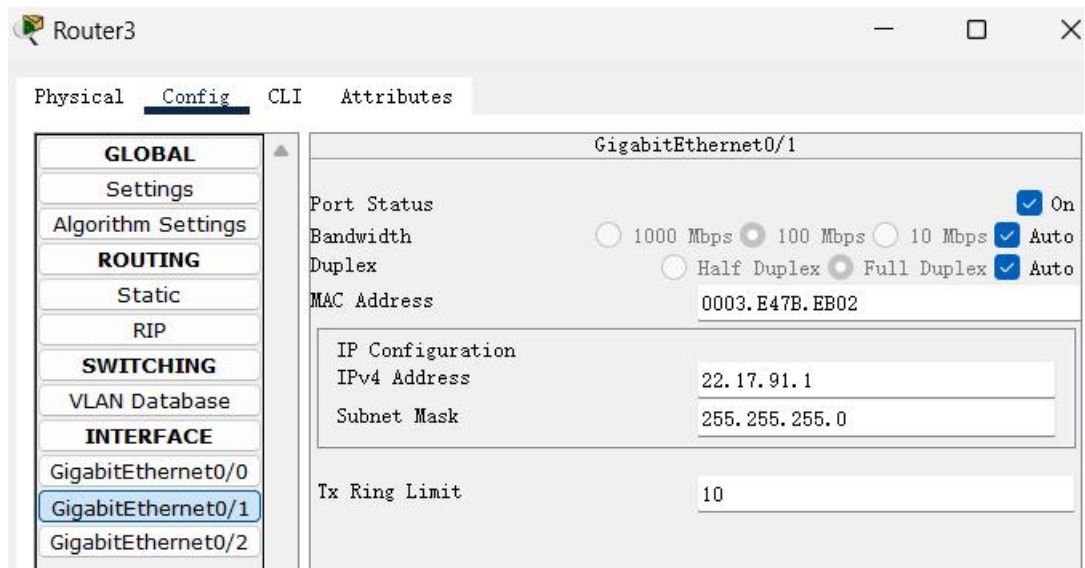
Network Address
22.17.85.0/24 via 22.17.88.1
22.17.86.0/24 via 22.17.88.1
22.17.87.0/24 via 22.17.88.1
22.17.91.0/24 via 22.17.90.2

路由器 R3:

两个接口的 IP 设置:





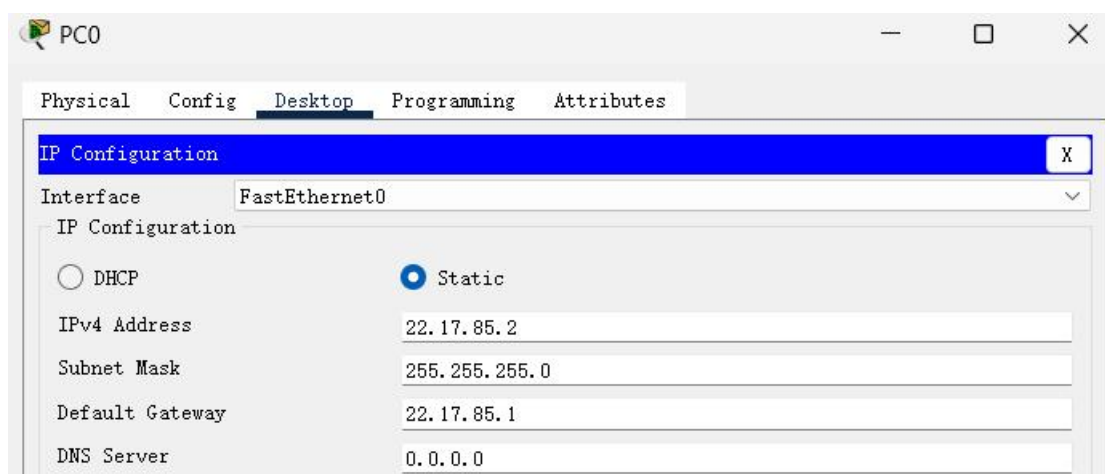


路由器 IP 跳转设置：

Network Address
22.17.85.0/24 via 22.17.90.1
22.17.86.0/24 via 22.17.90.1
22.17.87.0/24 via 22.17.90.1
22.17.88.0/24 via 22.17.90.1
22.17.89.0/24 via 22.17.90.1

主机 PC0：

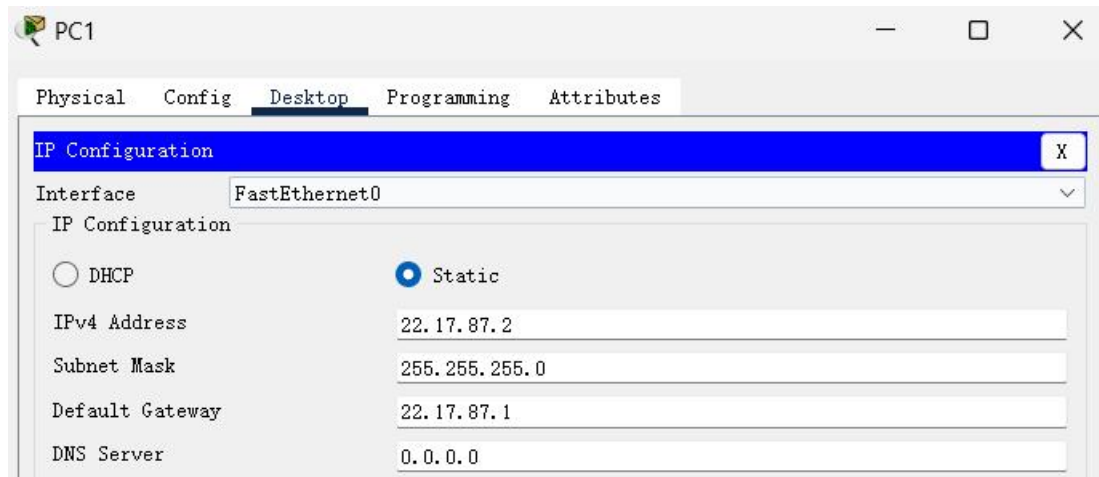
主机的 IP 设置：



主机 PC1：

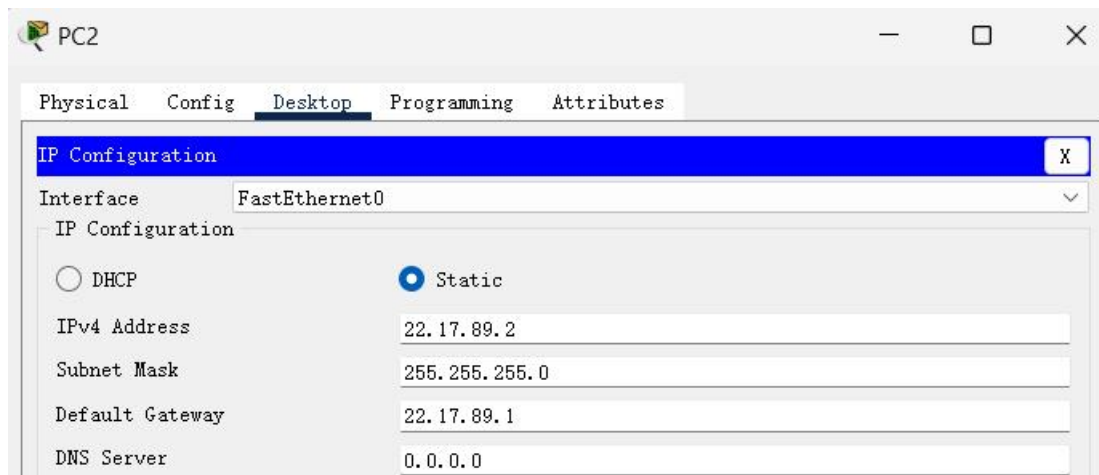
主机的 IP 设置：





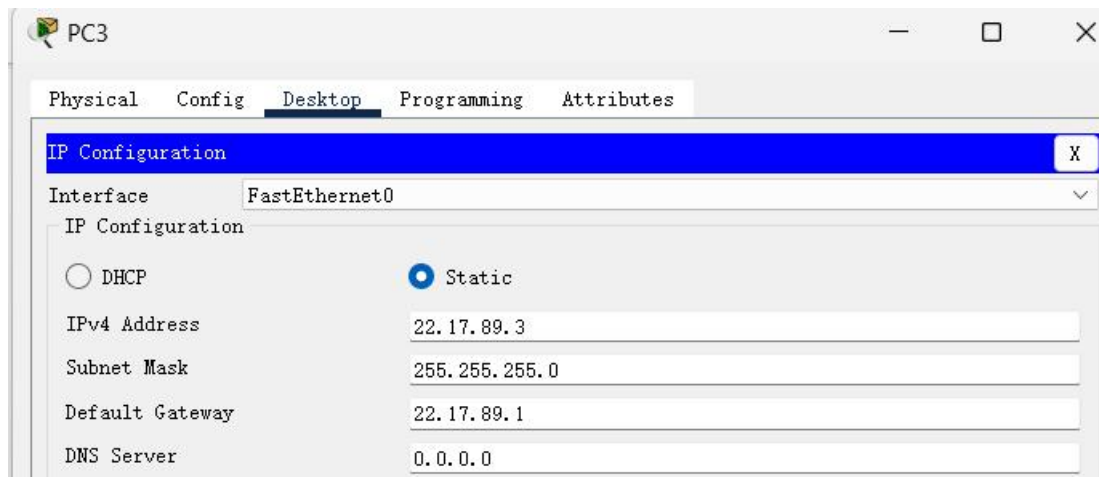
主机 PC2:

主机的 IP 设置:



主机 PC3

主机的 IP 设置:



连通性测试：

从 PC0 ‘ping’ 其余主机和服务器的测试截图：

```
C:\>ping 22.17.87.2

Pinging 22.17.87.2 with 32 bytes of data:

Reply from 22.17.87.2: bytes=32 time<1ms TTL=126
Reply from 22.17.87.2: bytes=32 time<1ms TTL=126
Reply from 22.17.87.2: bytes=32 time<1ms TTL=126
Reply from 22.17.87.2: bytes=32 time<1ms TTL=126

Ping statistics for 22.17.87.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 22.17.89.2

Pinging 22.17.89.2 with 32 bytes of data:

Reply from 22.17.89.2: bytes=32 time<1ms TTL=125
Reply from 22.17.89.2: bytes=32 time<1ms TTL=125
Reply from 22.17.89.2: bytes=32 time<1ms TTL=125
Reply from 22.17.89.2: bytes=32 time<1ms TTL=125

Ping statistics for 22.17.89.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 22.17.89.3

Pinging 22.17.89.3 with 32 bytes of data:

Reply from 22.17.89.3: bytes=32 time<1ms TTL=125
Reply from 22.17.89.3: bytes=32 time<1ms TTL=125
Reply from 22.17.89.3: bytes=32 time<1ms TTL=125
Reply from 22.17.89.3: bytes=32 time<1ms TTL=125

Ping statistics for 22.17.89.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 22.17.91.2

Pinging 22.17.91.2 with 32 bytes of data:

Reply from 22.17.91.2: bytes=32 time<1ms TTL=124
Reply from 22.17.91.2: bytes=32 time<1ms TTL=124
Reply from 22.17.91.2: bytes=32 time<1ms TTL=124
Reply from 22.17.91.2: bytes=32 time<1ms TTL=124

Ping statistics for 22.17.91.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

均可以 ping 通

补充：从 PC0 使用 ‘tracert’ 指令查看数据前往 PC1, PC2, S1 时 IP

地址的跳转

```

C:\>tracert 22.17.87.2

Tracing route to 22.17.87.2 over a maximum of 30 hops:

 1  0 ms    0 ms    0 ms    22.17.85.1
 2  0 ms    0 ms    0 ms    22.17.86.2
 3  0 ms    0 ms    3 ms    22.17.87.2

Trace complete.

C:\>tracert 22.17.89.2

Tracing route to 22.17.89.2 over a maximum of 30 hops:

 1  0 ms    0 ms    0 ms    22.17.85.1
 2  0 ms    0 ms    0 ms    22.17.86.2
 3  0 ms    0 ms    0 ms    22.17.88.2
 4  0 ms    0 ms    0 ms    22.17.89.2

Trace complete.

C:\>tracert 22.17.91.2

Tracing route to 22.17.91.2 over a maximum of 30 hops:

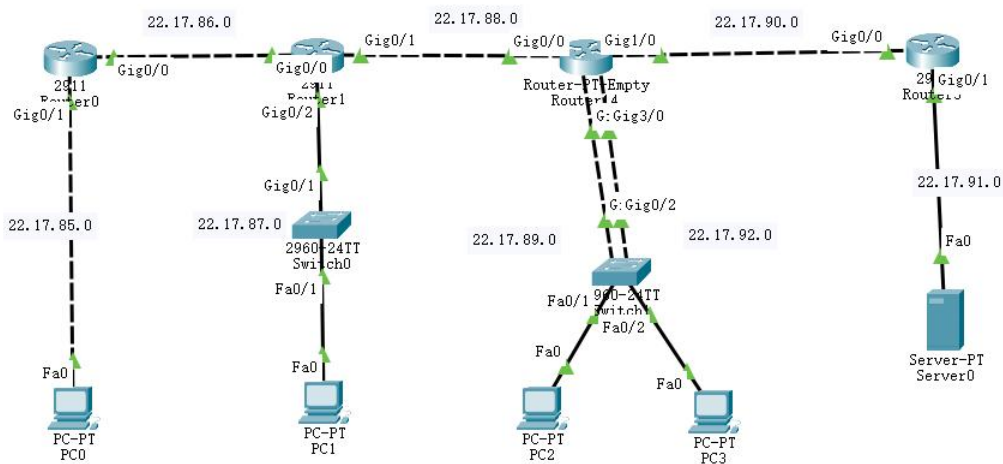
 1  0 ms    0 ms    0 ms    22.17.85.1
 2  0 ms    0 ms    0 ms    22.17.86.2
 3  0 ms    0 ms    0 ms    22.17.88.2
 4  0 ms    0 ms    0 ms    22.17.90.2
 5  0 ms    0 ms    0 ms    22.17.91.2

Trace complete.

```

## 实验 2（VLAN 设置）：

设计图：

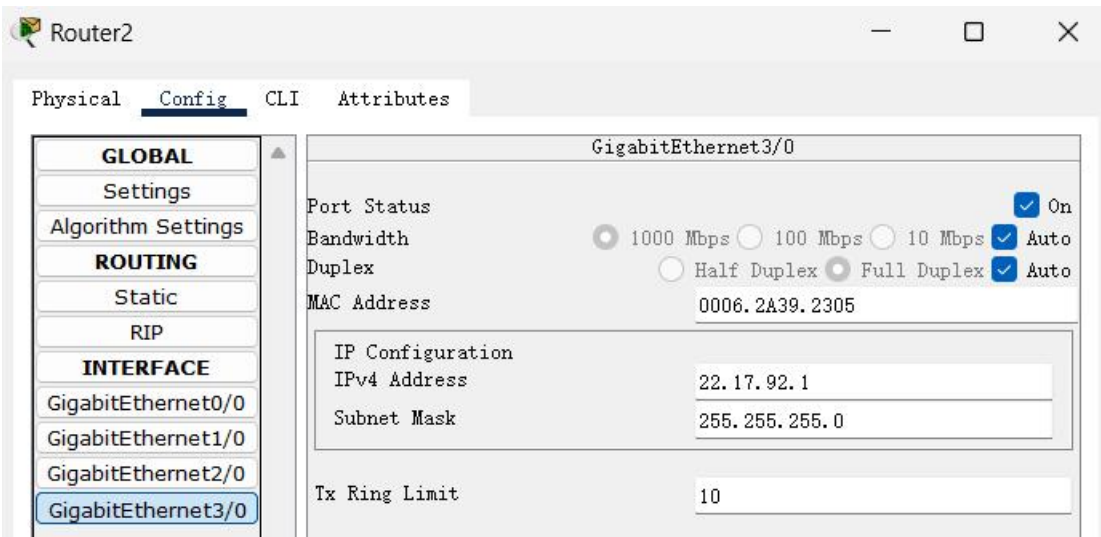


主要改变：

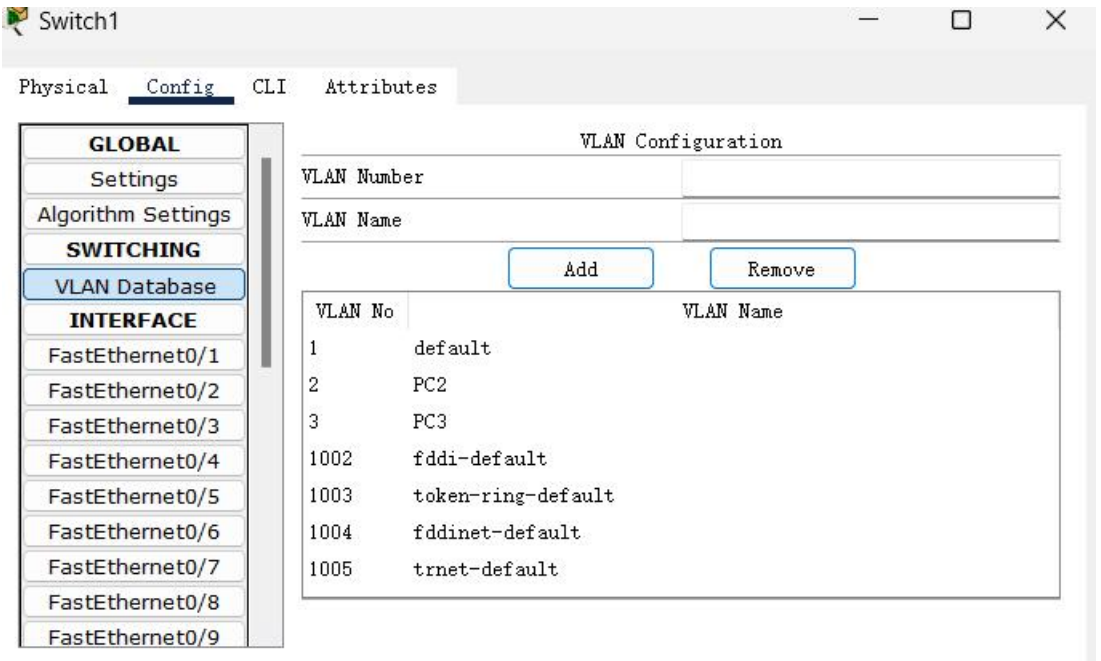
通过 VLAN 将 PC2 和 PC3 划分到了两个不同的子网中，分别为 22.17.89.0 和 22.17.92.0。路由器 R2 添加了一个接口划分到新的子网中，交换机 Switch1 采用 VLAN 设置新划分出两个虚拟局域网。

图片展示：

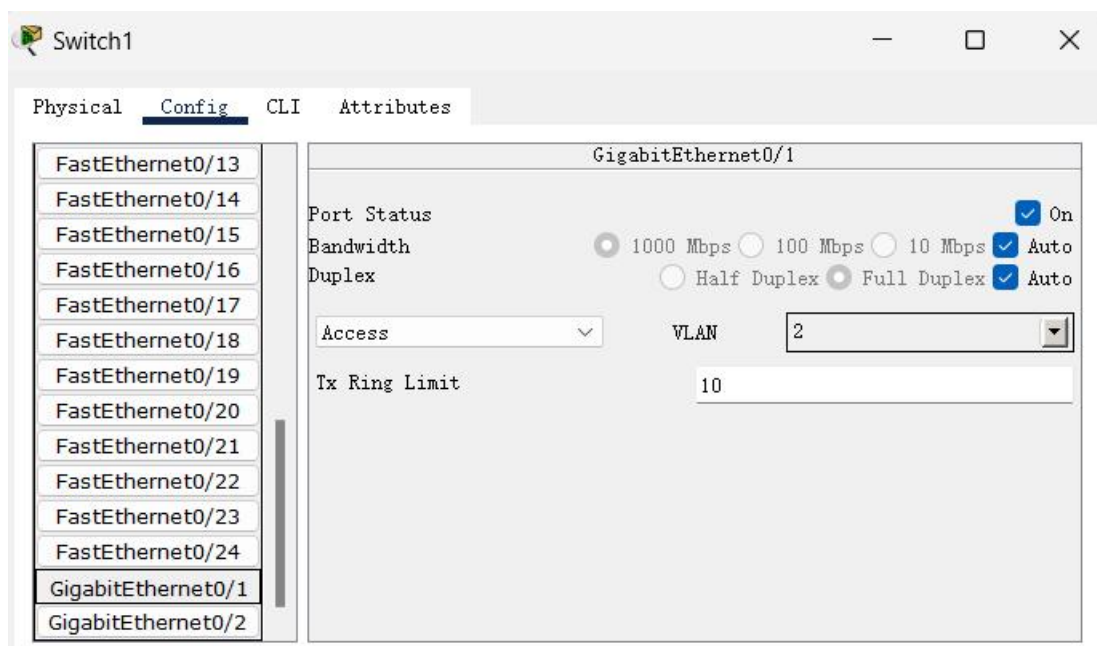
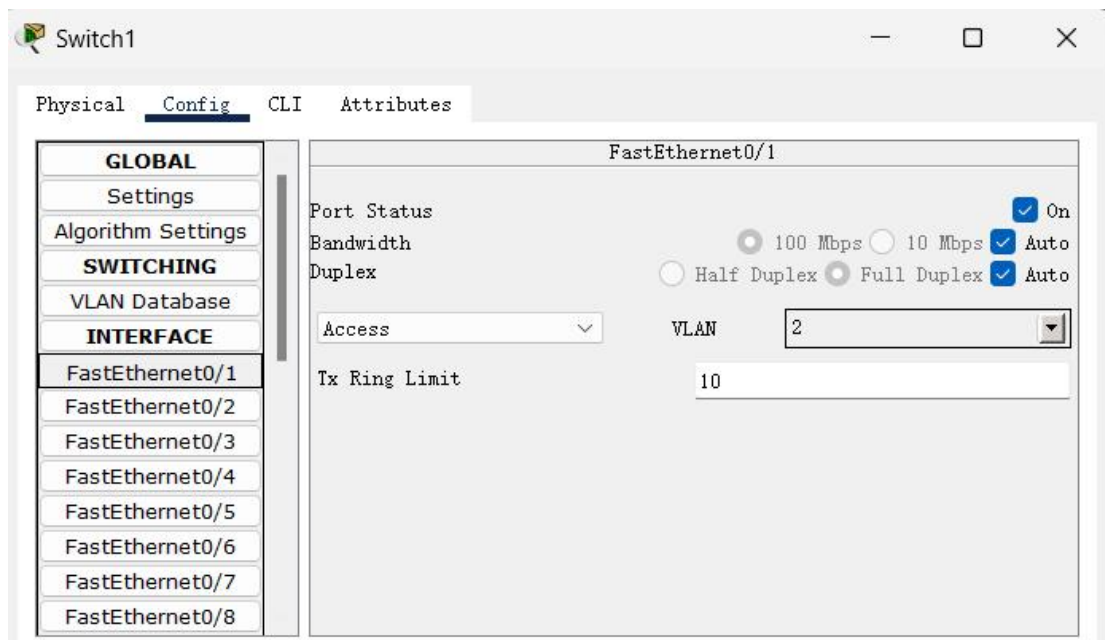
路由器 R2 添加了一个接口划分到新的子网中：



交换机 Switch1 采用 VLAN 设置新划分出两个虚拟局域网：

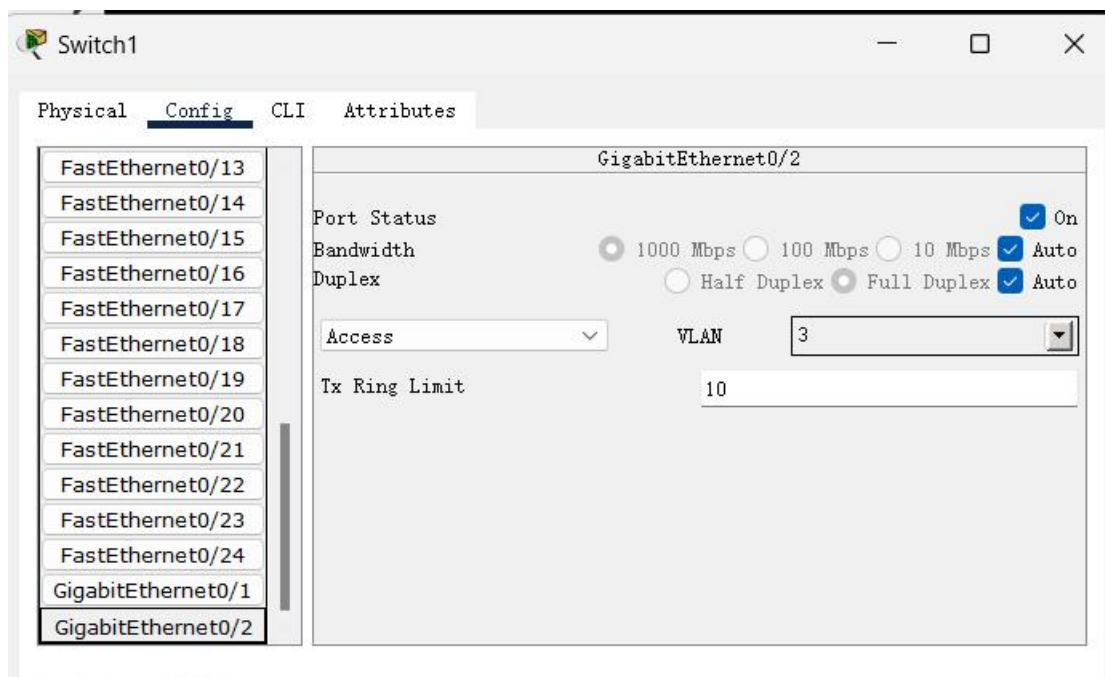
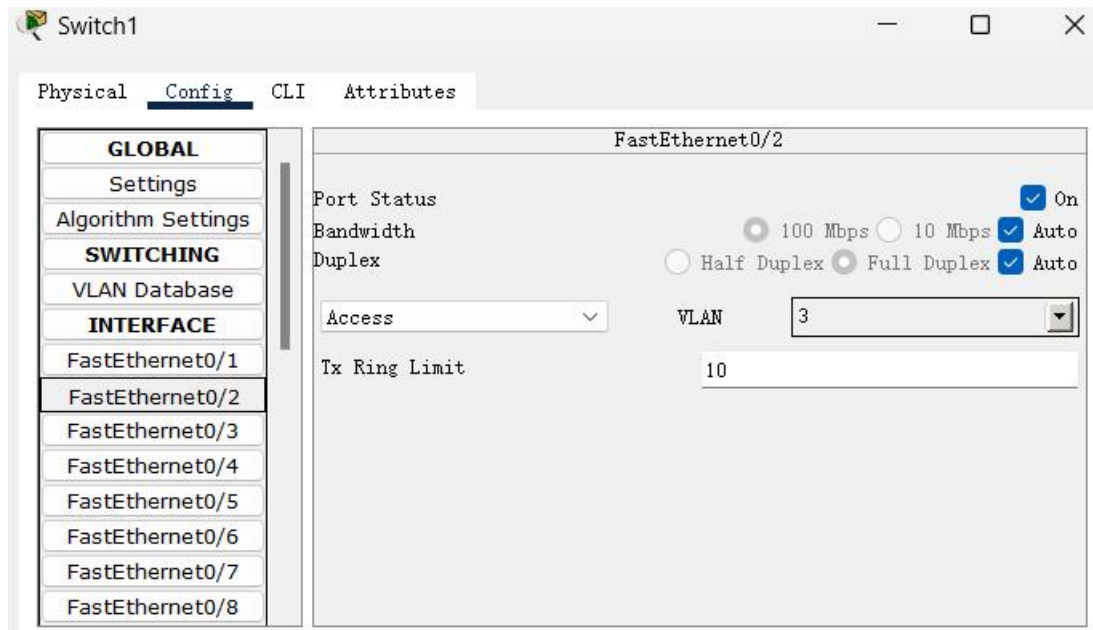


将 F0/1, G0/1 划分到 VLAN 2 中，F0/1 与 PC2 相连，G0/1 与路由器 R2 的 22.17.89.1 接口相连：





将 F0/2, G0/2 划分到 VLAN 3 中，F0/2 与 PC3 相连，G0/2 与路由器 R2 的 22.17.92.1 接口相连：



次要改变：

需要在各个路由器中添加指向新的子网 22.17.92.0 的跳转指令：

Network Address
22.17.88.0/24 via 22.17.86.2
22.17.89.0/24 via 22.17.86.2
22.17.90.0/24 via 22.17.86.2
22.17.91.0/24 via 22.17.86.2
22.17.92.0/24 via 22.17.86.2