

计算机网络实验

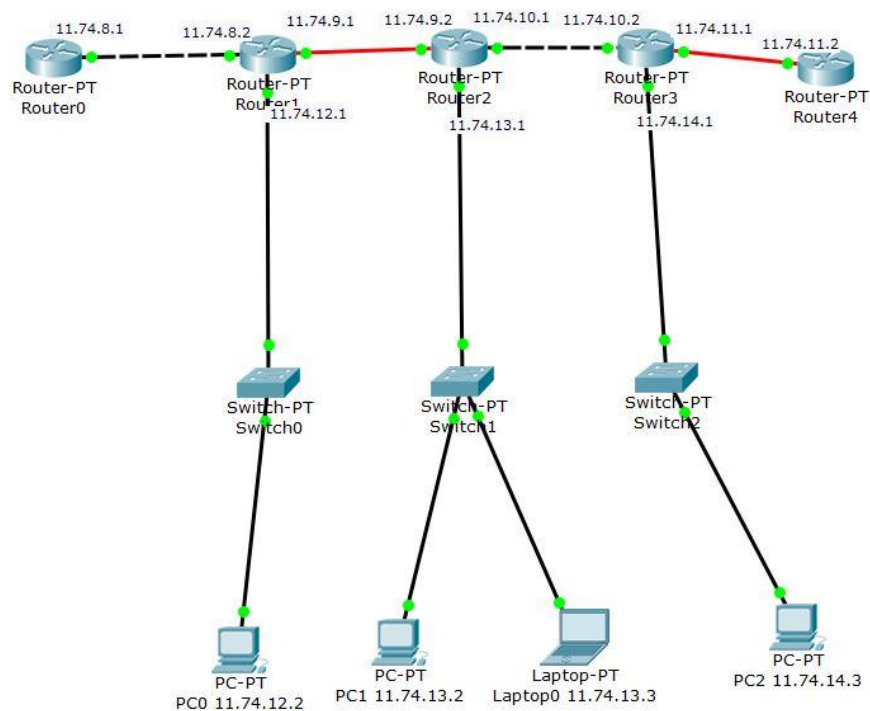
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实验一

1. 设计目标：四台主机接入三台交换机并通过五台路由器形成七个局域网，局域网网
络号：11.74.8.0~11.74.14.0，配置路由表使得局域网间相互联通

2. 配置方案：使用三台交换机 switch0~3 与 PC 连接，其中 switch0 连接处于局域网
11.74.12.0 的 PC0，switch1 连接处于局域网 11.74.13.0 的 PC1 与 Laptop0，switch2
连接处于局域网 11.74.14.0 的 PC2。使用五台路由器连接七个局域网，使三台交换
机分别与三台路由器相连

逻辑拓扑：



路由器配置：

Router0:

Router0

Physical

Config

CLI

Attributes

```
!
!
interface FastEthernet0/0
  no ip address
  duplex auto
  speed auto
!
interface FastEthernet1/0
  ip address 11.74.8.1 255.255.255.0
  duplex auto
  speed auto
!
interface Serial2/0
  no ip address
  clock rate 2000000
!
interface Serial3/0
  no ip address
  clock rate 2000000
!
interface FastEthernet4/0
  no ip address
!
interface FastEthernet5/0
  no ip address
!
ip classless
ip route 11.74.12.0 255.255.255.0 11.74.8.2
ip route 11.74.13.0 255.255.255.0 11.74.8.2
ip route 11.74.14.0 255.255.255.0 11.74.8.2
ip route 11.74.10.0 255.255.255.0 11.74.8.2
ip route 11.74.9.0 255.255.255.0 11.74.8.2
ip route 11.74.11.0 255.255.255.0 11.74.8.2
!
ip flow-export version 9
!
!
!
```

Router1:

 Router1

Physical Config CLI Attributes

```
interface FastEthernet0/0
ip address 11.74.8.2 255.255.255.0
duplex auto
speed auto
!
interface FastEthernet1/0
ip address 11.74.12.1 255.255.255.0
duplex auto
speed auto
!
interface Serial2/0
no ip address
clock rate 2000000
!
interface Serial3/0
no ip address
clock rate 2000000
!
interface FastEthernet4/0
ip address 11.74.9.1 255.255.255.0
!
interface FastEthernet5/0
no ip address
!
ip classless
ip route 11.74.13.0 255.255.255.0 11.74.9.2
ip route 11.74.14.0 255.255.255.0 11.74.9.2
ip route 11.74.8.0 255.255.255.0 11.74.8.1
ip route 11.74.11.0 255.255.255.0 11.74.9.2
ip route 11.74.10.0 255.255.255.0 11.74.9.2
ip route 11.74.9.0 255.255.255.0 11.74.9.2
!
ip flow-export version 9
!
```

Router2:



Router2

Physical


Config

CLI

Attributes

```
!  
interface FastEthernet0/0  
  ip address 11.74.10.1 255.255.255.0  
  duplex auto  
  speed auto  
!  
interface FastEthernet1/0  
  ip address 11.74.13.1 255.255.255.0  
  duplex auto  
  speed auto  
!  
interface Serial2/0  
  no ip address  
  clock rate 2000000  
  shutdown  
!  
interface Serial3/0  
  no ip address  
  clock rate 2000000  
  shutdown  
!  
interface FastEthernet4/0  
  ip address 11.74.9.2 255.255.255.0  
!  
interface FastEthernet5/0  
  no ip address  
  shutdown  
!  
ip classless  
ip route 11.74.12.0 255.255.255.0 11.74.9.1  
ip route 11.74.14.0 255.255.255.0 11.74.10.2  
ip route 11.74.8.0 255.255.255.0 11.74.9.1  
ip route 11.74.10.0 255.255.255.0 11.74.10.2  
ip route 11.74.11.0 255.255.255.0 11.74.10.2  
!  
ip flow-export version 9  
!
```


Router3:

 Router3

| Physical | Config | CLI | Attributes |
|----------|--------|-----|------------|
|----------|--------|-----|------------|

```
interface FastEthernet0/0
 ip address 11.74.10.2 255.255.255.0
 duplex auto
 speed auto
!
interface FastEthernet1/0
 ip address 11.74.14.1 255.255.255.0
 duplex auto
 speed auto
!
interface Serial2/0
 no ip address
 clock rate 2000000
 shutdown
!
interface Serial3/0
 no ip address
 clock rate 2000000
 shutdown
!
interface FastEthernet4/0
 ip address 11.74.11.1 255.255.255.0
!
interface FastEthernet5/0
 no ip address
 shutdown
!
ip classless
ip route 11.74.13.0 255.255.255.0 11.74.10.1
ip route 11.74.12.0 255.255.255.0 11.74.10.1
ip route 11.74.8.0 255.255.255.0 11.74.10.1
ip route 11.74.14.0 255.255.255.0 11.74.11.2
ip route 11.74.11.0 255.255.255.0 11.74.10.1
!
ip flow-export version 9
!
```

Router4

 Router4


Physical Config CLI Attributes

```
interface FastEthernet0/0
no ip address
duplex auto
speed auto
!
interface FastEthernet1/0
no ip address
duplex auto
speed auto
!
interface Serial2/0
no ip address
clock rate 2000000
shutdown
!
interface Serial3/0
no ip address
clock rate 2000000
shutdown
!
interface FastEthernet4/0
ip address 11.74.11.2 255.255.255.0
!
interface FastEthernet5/0
no ip address
shutdown
!
ip classless
ip route 11.74.14.0 255.255.255.0 11.74.11.1
ip route 11.74.13.0 255.255.255.0 11.74.11.1
ip route 11.74.12.0 255.255.255.0 11.74.11.1
ip route 11.74.10.0 255.255.255.0 11.74.11.1
ip route 11.74.9.0 255.255.255.0 11.74.11.1
ip route 11.74.8.0 255.255.255.0 11.74.11.1
!
ip flow-export version 9
!
```

主机配置 (PC 与 Laptop):

将主机与连接路由器的交换机连接后, 设置主机 IP 与路由器对应接口 IP 处于同一子网, 网关为路由器对应的接口 IP

PC0:

 PC0 11.74.12.2

Physical Config Desktop Attributes Software/Services

IP Configuration X

IP Configuration

☐ DHCP ☒ Static

IP Address

11.74.12.2

Subnet Mask

255.255.255.0

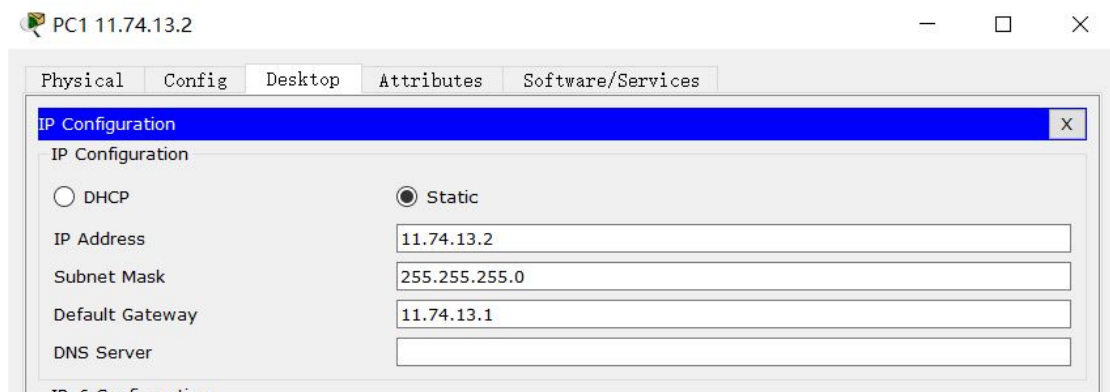
Default Gateway

11.74.12.1

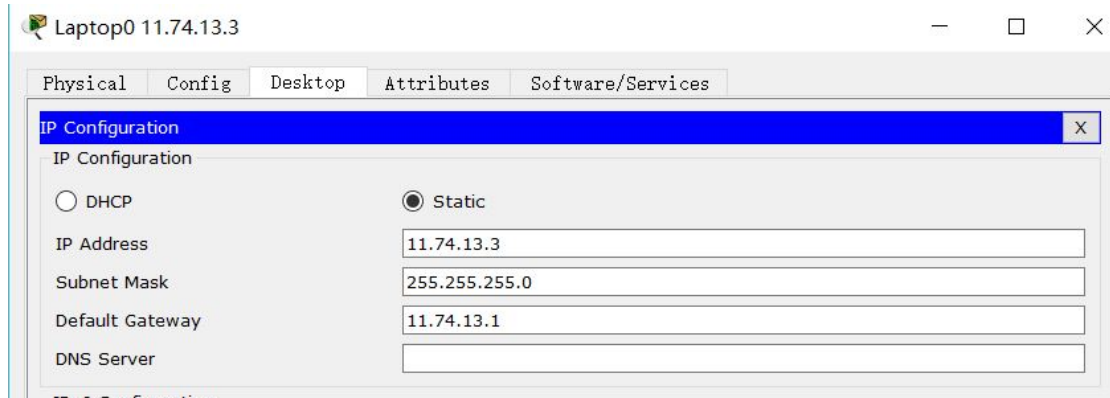
DNS Server

IPv6 Configuration

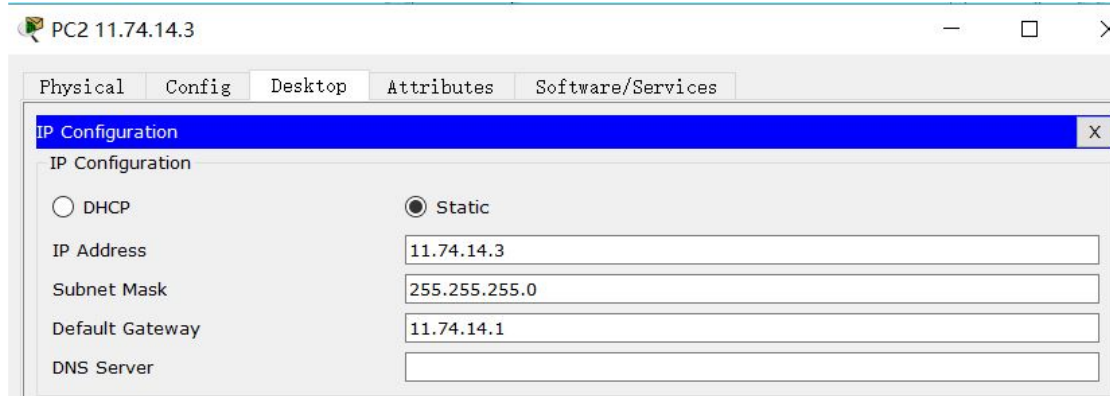
PC1:



Laptop0:



PC2:



3. 结果测试:

使用主机对不同子网的连通性进行测试, 由于 ping 采用 ICMP 协议在应用层为用户提供网络层工具, 使用 desktop 中 Command prompt 可使用 ping 完成连通性测试

PC0 11.74.12.2

| | | | | |
|----------|--------|---------|------------|----------------|
| Physical | Config | Desktop | Attributes | Software/Servi |
|----------|--------|---------|------------|----------------|

Command Prompt

```
Pinging 11.74.8.0 with 32 bytes of data:

Reply from 11.74.12.1: bytes=32 time<1ms TTL=255
Reply from 11.74.12.1: bytes=32 time<1ms TTL=255
Reply from 11.74.12.1: bytes=32 time<1ms TTL=255
Reply from 11.74.12.1: bytes=32 time<1ms TTL=255

Ping statistics for 11.74.8.0:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 11.74.9.0

Pinging 11.74.9.0 with 32 bytes of data:

Reply from 11.74.12.1: bytes=32 time<1ms TTL=255
Reply from 11.74.12.1: bytes=32 time<1ms TTL=255
Reply from 11.74.12.1: bytes=32 time<1ms TTL=255
Reply from 11.74.12.1: bytes=32 time=2ms TTL=255

Ping statistics for 11.74.9.0:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>ping 11.74.10.0

Pinging 11.74.10.0 with 32 bytes of data:

Request timed out.
Reply from 11.74.9.2: bytes=32 time<1ms TTL=254
Reply from 11.74.9.2: bytes=32 time<1ms TTL=254
Reply from 11.74.9.2: bytes=32 time<1ms TTL=254

Ping statistics for 11.74.10.0:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 11.74.11.0

Pinging 11.74.11.0 with 32 bytes of data:

Request timed out.
Reply from 11.74.10.2: bytes=32 time<1ms TTL=253
Reply from 11.74.10.2: bytes=32 time<1ms TTL=253
Reply from 11.74.10.2: bytes=32 time<1ms TTL=253

Ping statistics for 11.74.11.0:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
```


PC1 11.74.13.2

Physical Config Desktop Attributes Software/Service

Command Prompt

```
Pinging 11.74.9.0 with 32 bytes of data:

Reply from 11.74.13.1: bytes=32 time<1ms TTL=255
Reply from 11.74.13.1: bytes=32 time<1ms TTL=255
Reply from 11.74.13.1: bytes=32 time<1ms TTL=255
Reply from 11.74.13.1: bytes=32 time<1ms TTL=255

Ping statistics for 11.74.9.0:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 11.74.10.0

Pinging 11.74.10.0 with 32 bytes of data:

Reply from 11.74.13.1: bytes=32 time<1ms TTL=255
Reply from 11.74.13.1: bytes=32 time<1ms TTL=255
Reply from 11.74.13.1: bytes=32 time<1ms TTL=255
Reply from 11.74.13.1: bytes=32 time<1ms TTL=255

Ping statistics for 11.74.10.0:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 11.74.11.0

Pinging 11.74.11.0 with 32 bytes of data:

Reply from 11.74.10.2: bytes=32 time=1ms TTL=254
Reply from 11.74.10.2: bytes=32 time<1ms TTL=254
Reply from 11.74.10.2: bytes=32 time<1ms TTL=254
Reply from 11.74.10.2: bytes=32 time<1ms TTL=254

Ping statistics for 11.74.11.0:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 11.74.12.0

Pinging 11.74.12.0 with 32 bytes of data:

Reply from 11.74.9.1: bytes=32 time<1ms TTL=254
Reply from 11.74.9.1: bytes=32 time<1ms TTL=254
Reply from 11.74.9.1: bytes=32 time<1ms TTL=254
Reply from 11.74.9.1: bytes=32 time<1ms TTL=254

Ping statistics for 11.74.12.0:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

PC2 11.74.14.3

```
Physical Config Desktop Attributes Software/Serv
Command Prompt
C:\>ping 11.74.9.0

Pinging 11.74.9.0 with 32 bytes of data:

Reply from 11.74.10.1: bytes=32 time=1ms TTL=254
Reply from 11.74.10.1: bytes=32 time<1ms TTL=254
Reply from 11.74.10.1: bytes=32 time=1ms TTL=254
Reply from 11.74.10.1: bytes=32 time<1ms TTL=254

Ping statistics for 11.74.9.0:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 11.74.10.0

Pinging 11.74.10.0 with 32 bytes of data:

Reply from 11.74.14.1: bytes=32 time<1ms TTL=255
Reply from 11.74.14.1: bytes=32 time<1ms TTL=255
Reply from 11.74.14.1: bytes=32 time<1ms TTL=255
Reply from 11.74.14.1: bytes=32 time<1ms TTL=255

Ping statistics for 11.74.10.0:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 11.74.11.0

Pinging 11.74.11.0 with 32 bytes of data:

Reply from 11.74.14.1: bytes=32 time<1ms TTL=255
Reply from 11.74.14.1: bytes=32 time<1ms TTL=255
Reply from 11.74.14.1: bytes=32 time<1ms TTL=255
Reply from 11.74.14.1: bytes=32 time<1ms TTL=255

Ping statistics for 11.74.11.0:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 11.74.12.0

Pinging 11.74.12.0 with 32 bytes of data:

Reply from 11.74.9.1: bytes=32 time<1ms TTL=253
Reply from 11.74.9.1: bytes=32 time=1ms TTL=253
Reply from 11.74.9.1: bytes=32 time<1ms TTL=253
Reply from 11.74.9.1: bytes=32 time<1ms TTL=253

Ping statistics for 11.74.12.0:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
```

4. 实验小结:

本实验使用交换机与路由器构建了七个局域网，并通过路由器的路由表配置使得子网间相互联通，最后使用主机测试了子网间联通性。在未设置 vlan 时连接相同交换

机的主机可以直接 ping 通，而通过路由器连接的不同子网中的主机则需要通过路由器转发