天津大学本科生实验报告专用纸

学院智算学部年级 2019 专业软件工程班级 1 班 姓名俞林昊 学号 3019207450

课程名称 计算机网络 实验日期 2021.6 成绩

同组实验者

综合组网设计实验(新老校区网络模拟)

1. 实验目的

1) 了解不同类型的计算机网络，及其组网形式。

2) 深入理解 TCP/IP 协议，掌握传统网络的基本架构及基于 TCP/IP 协议的基本工作原理

3) 理解并掌握 RIP、OSPF 等网络协议在传统局域网的原理，并能实际运用。了解 vlan 间路由的基本原理。

4) 掌握 CIDR 地址划分的方法，掌握 vlan 划分在交换机中的实际运用。

5) 深入理解 DNS、HTTP 等协议的原理。

2. 实验环境

1) 接入 Internet 的实验主机

2) windows 操作系统

3) Cisco Packet Tracer 软件

3. 实验内容

1) 用两台路由器连接两个局域网，并熟悉 RIP、OSPF 协议的配置、Trace Route 命令的使用。

2) 用多台交换机组成局域网，并熟悉三层交换机的配置、vlan 的配置。

3) 熟悉 DNS 服务器与 HTTP 服务器的配置。

4) 设计并模拟实现天津大学两个校区之间的校园网连接。

要求:每个校区需支持 4 个学院使用校园网,老校区学院 1 至 4 最多支持的设备数为 2000、4000、4000、6000，新校区学院 5 至 8 最多支持的设备数为 1000、2000、4000、8000，请给出两个校区 IP block 区间。在新校区，学院 5 与学院 6 两个学院物理位置相邻共享一个路由器，使用 VLAN 技术设置为不同的子网，并给出每个学院的地址块。给出每个路由器、交换机的端口数。测试网络连通性后，在老校区架设一台 HTTP 服务器，指定域名(www.tju.edu.cn)、IP 并添加一个 html 静态页面，在新老校区各架设一台 DNS 服

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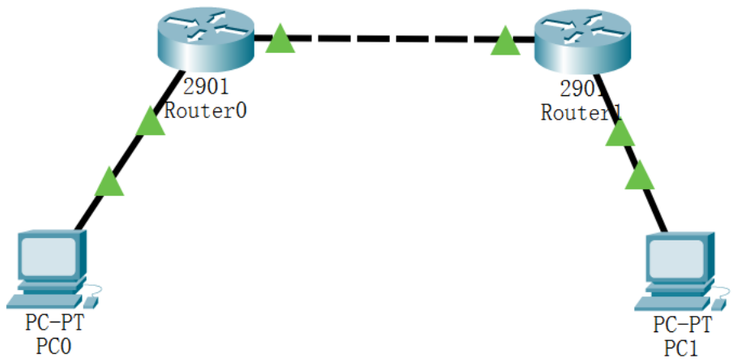
务器，实现新老校区均可以使用 www.tju.edu.cn 访问 HTTP 服务器。

4. 实验参考步骤

1) 用两台路由器连接两个局域网，并熟悉 RIP、OSPF 协议的配置、Trace Route 命令的使用。

1.建立如图拓扑



配置路由和 PC

```
Device Name: Router0
Device Model: 2901
Hostname: Router

Port                 Link   VLAN   IP Address          IPv6 Address                              MAC Address
GigabitEthernet0/0   Up     --     10.10.1.1/8         <not set>                                 00D0.D385.4401
GigabitEthernet0/1   Up     --     192.168.1.1/24      <not set>                                 00D0.D385.4402
Vlan1                Down   1      <not set>           <not set>                                 0090.2110.15C5

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Router0
```

```
Device Name: Router1
Device Model: 2901
Hostname: Router

Port                 Link   VLAN   IP Address          IPv6 Address                              MAC Address
GigabitEthernet0/0   Up     --     10.10.1.2/8         <not set>                                 0001.648E.0501
GigabitEthernet0/1   Up     --     192.168.2.1/24      <not set>                                 0001.648E.0502
Vlan1                Down   1      <not set>           <not set>                                 0001.4250.44B7

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Router1
```

```
Device Name: PC0
Device Model: PC-PT

Port            Link   IP Address        IPv6 Address                            MAC Address
FastEthernet0   Down   192.168.1.2/24    <not set>                               0002.4A4C.310D
Bluetooth       Down   <not set>         <not set>                               00E0.F95B.95B8

Gateway: 192.168.1.1
DNS Server:  <not set>
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > PC0
```

```
Device Name: PC1
Device Model: PC-PT

Port            Link   IP Address         IPv6 Address                            MAC Address
FastEthernet0   Down   192.168.2.2/24     <not set>                               00D0.586D.018C
Bluetooth       Down   <not set>          <not set>                               0090.2BCA.DE2B

Gateway: 192.168.2.1
DNS Server:  <not set>
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > PC1
```

配置路由协议

Router 0:

```
Router#enable
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 192.168.1.0
Router(config-router)#version 2
Router(config-router)#
```

Router 1:

```
Router>enable
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 192.168.2.0
Router(config-router)#version 2
Router(config-router)#
```

测试网络的联通性

PC0 -> PC1

```
C:\>ping 192.168.2.2

Pinging 192.168.2.2 with 32 bytes of data:

Reply from 192.168.2.2: bytes=32 time<1ms TTL=126
Reply from 192.168.2.2: bytes=32 time=11ms TTL=126
Reply from 192.168.2.2: bytes=32 time=11ms TTL=126
Reply from 192.168.2.2: bytes=32 time<1ms TTL=126

Ping statistics for 192.168.2.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 11ms, Average = 5ms
```

使用 tracert 命令查看路径

```
C:\>tracert 192.168.2.2

Tracing route to 192.168.2.2 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      192.168.1.1
  2    0 ms      0 ms      0 ms      10.10.1.2
  3    0 ms      0 ms      12 ms     192.168.2.2

Trace complete.
```

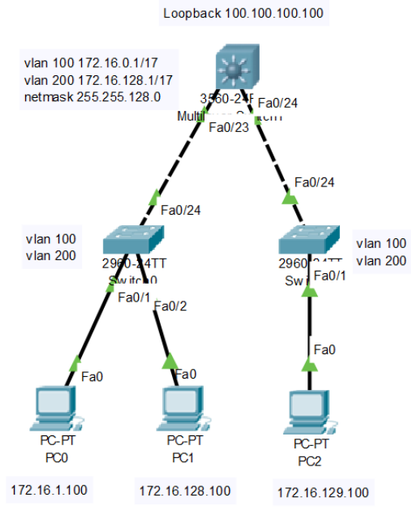
查看 Router 0 的路由表

```
Router#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

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.0.0.0/8 is directly connected, GigabitEthernet0/0
L       10.10.1.1/32 is directly connected, GigabitEthernet0/0
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, GigabitEthernet0/1
L       192.168.1.1/32 is directly connected, GigabitEthernet0/1
R    192.168.2.0/24 [120/1] via 10.10.1.2, 00:00:11, GigabitEthernet0/0
```

可以看到 Router0 通过 RIP 协议学习到了 Router1 上的网段。

2) 用多台交换机组成局域网，并熟悉三层交换机的配置、vlan 的配置

1.建立如下图所示拓扑，并为 PC 配置 IP 地址、掩码、网关。



PC0:

```
Device Name: PC0
Device Model: PC-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.16.1.100/17    <not set>                                 00E0.B023.C508
Bluetooth       Down   <not set>          <not set>                                 00D0.BC91.9D8A

Gateway: 172.16.0.1
DNS Server:  <not set>
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > PC0
```

PC1:

```
Device Name: PC1
Device Model: PC-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.16.128.100/17  <not set>                                 0090.2BA2.7411
Bluetooth       Down   <not set>          <not set>                                 000C.8545.5209

Gateway: 172.16.128.1
DNS Server:  <not set>
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > PC1
```

PC2:

```
Device Name: PC2
Device Model: PC-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.16.129.100/17  <not set>                                 0060.2F09.D1BC
Bluetooth       Down   <not set>          <not set>                                 0001.976B.BDBE

Gateway: 172.16.128.1
DNS Server:  <not set>
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > PC2
```

1 配置 VLAN 间路由

```
Switch>en
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int lookup 0
                   ^
% Invalid input detected at '^' marker.

Switch(config)#int loopback 0

Switch(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

Switch(config-if)#ip add 100.100.100.100 255.255.255.0
```

配置 VLAN 的结果：

```
Device Name: Multilayer Switch0
Device Model: 3560-24PS
Hostname: Switch

Port                Link   VLAN   IP Address         IPv6 Address                              MAC Address
FastEthernet0/1     Down   1      <not set>          <not set>                                 000A.F332.0701
FastEthernet0/2     Down   1      <not set>          <not set>                                 000A.F332.0702
FastEthernet0/3     Down   1      <not set>          <not set>                                 000A.F332.0703
FastEthernet0/4     Down   1      <not set>          <not set>                                 000A.F332.0704
FastEthernet0/5     Down   1      <not set>          <not set>                                 000A.F332.0705
FastEthernet0/6     Down   1      <not set>          <not set>                                 000A.F332.0706
FastEthernet0/7     Down   1      <not set>          <not set>                                 000A.F332.0707
FastEthernet0/8     Down   1      <not set>          <not set>                                 000A.F332.0708
FastEthernet0/9     Down   1      <not set>          <not set>                                 000A.F332.0709
FastEthernet0/10    Down   1      <not set>          <not set>                                 000A.F332.070A
FastEthernet0/11    Down   1      <not set>          <not set>                                 000A.F332.070B
FastEthernet0/12    Down   1      <not set>          <not set>                                 000A.F332.070C
FastEthernet0/13    Down   1      <not set>          <not set>                                 000A.F332.070D
FastEthernet0/14    Down   1      <not set>          <not set>                                 000A.F332.070E
FastEthernet0/15    Down   1      <not set>          <not set>                                 000A.F332.070F
FastEthernet0/16    Down   1      <not set>          <not set>                                 000A.F332.0710
FastEthernet0/17    Down   1      <not set>          <not set>                                 000A.F332.0711
FastEthernet0/18    Down   1      <not set>          <not set>                                 000A.F332.0712
FastEthernet0/19    Down   1      <not set>          <not set>                                 000A.F332.0713
FastEthernet0/20    Down   1      <not set>          <not set>                                 000A.F332.0714
FastEthernet0/21    Down   1      <not set>          <not set>                                 000A.F332.0715
FastEthernet0/22    Down   1      <not set>          <not set>                                 000A.F332.0716
FastEthernet0/23    Up     1      <not set>          <not set>                                 000A.F332.0717
FastEthernet0/24    Up     1      <not set>          <not set>                                 000A.F332.0718
GigabitEthernet0/1  Down   1      <not set>          <not set>                                 000A.F332.0719
GigabitEthernet0/2  Down   1      <not set>          <not set>                                 000A.F332.071A
Loopback0           Up     --     100.100.100.100/24 <not set>                                 0010.11D2.DA4C
Vlan1               Down   1      <not set>          <not set>                                 000C.CFB3.A8D4

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Multilayer Switch0
```

2 在三层交换机中配置 VLAN

进入命令行界面，先在 vlan 数据库中建立 vlan100 和 vlan200。如下图所示：

```
Switch(vlan)#ex
APPLY completed.
Exiting....
Switch#vlan data
% Warning: It is recommended to configure VLAN from config mode,
  as VLAN database mode is being deprecated. Please consult user
  documentation for configuring VTP/VLAN in config mode.

Switch(vlan)#vlan 100
VLAN 100 added:
    Name: VLAN0100
Switch(vlan)#vlan 200
VLAN 200 added:
    Name: VLAN0200
Switch(vlan)#ex
APPLY completed.
Exiting....
Switch#
```

下一步，进入配置模式，配置 vlan100 与 vlan200 的 IP 地址。如下图所示：

```
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int vlan 100
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan100, changed state to up

Switch(config-if)#ip add 172.16.0.1 255.255.128.0
Switch(config-if)#no shutdown
Switch(config-if)#
Switch(config-if)#int vlan 200
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan200, changed state to up

Switch(config-if)#ip add 172.16.128.1 255.255.128.0
Switch(config-if)#no shutdown
Switch(config-if)#ex
Switch(config)#
```

配置结果如下：

```
Device Name: Multilayer Switch0
Device Model: 3560-24PS
Hostname: Switch

Port                Link   VLAN   IP Address         IPv6 Address                              MAC Address
FastEthernet0/1     Down   1      <not set>          <not set>                                 000A.F332.0701
FastEthernet0/2     Down   1      <not set>          <not set>                                 000A.F332.0702
FastEthernet0/3     Down   1      <not set>          <not set>                                 000A.F332.0703
FastEthernet0/4     Down   1      <not set>          <not set>                                 000A.F332.0704
FastEthernet0/5     Down   1      <not set>          <not set>                                 000A.F332.0705
FastEthernet0/6     Down   1      <not set>          <not set>                                 000A.F332.0706
FastEthernet0/7     Down   1      <not set>          <not set>                                 000A.F332.0707
FastEthernet0/8     Down   1      <not set>          <not set>                                 000A.F332.0708
FastEthernet0/9     Down   1      <not set>          <not set>                                 000A.F332.0709
FastEthernet0/10    Down   1      <not set>          <not set>                                 000A.F332.070A
FastEthernet0/11    Down   1      <not set>          <not set>                                 000A.F332.070B
FastEthernet0/12    Down   1      <not set>          <not set>                                 000A.F332.070C
FastEthernet0/13    Down   1      <not set>          <not set>                                 000A.F332.070D
FastEthernet0/14    Down   1      <not set>          <not set>                                 000A.F332.070E
FastEthernet0/15    Down   1      <not set>          <not set>                                 000A.F332.070F
FastEthernet0/16    Down   1      <not set>          <not set>                                 000A.F332.0710
FastEthernet0/17    Down   1      <not set>          <not set>                                 000A.F332.0711
FastEthernet0/18    Down   1      <not set>          <not set>                                 000A.F332.0712
FastEthernet0/19    Down   1      <not set>          <not set>                                 000A.F332.0713
FastEthernet0/20    Down   1      <not set>          <not set>                                 000A.F332.0714
FastEthernet0/21    Down   1      <not set>          <not set>                                 000A.F332.0715
FastEthernet0/22    Down   1      <not set>          <not set>                                 000A.F332.0716
FastEthernet0/23    Up     1      <not set>          <not set>                                 000A.F332.0717
FastEthernet0/24    Up     1      <not set>          <not set>                                 000A.F332.0718
GigabitEthernet0/1  Down   1      <not set>          <not set>                                 000A.F332.0719
GigabitEthernet0/2  Down   1      <not set>          <not set>                                 000A.F332.071A
Loopback0           Up     --     100.100.100.100/24 <not set>                                 0010.11D2.DA4C
Vlan1               Down   1      <not set>          <not set>                                 000C.CFB3.A8D4
Vlan100             Up     100    172.16.0.1/17      <not set>                                 000C.CFB3.A801
Vlan200             Up     200    172.16.128.1/17    <not set>                                 000C.CFB3.A802

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Multilayer Switch0
```

3 为三层交换机配置路由

```
Switch(config)#
Switch(config)#ip routing
Switch(config)#router rip
Switch(config-router)#version 2
Switch(config-router)#network 172.16.0.0
Switch(config-router)#network 100.100.100.0
Switch(config-router)#ex
Switch(config)#
```

4 为三层交换机封装 trunk 链路

将三层交换机的 f0/23-24 端口封装为 trunk 链路，如下图所示：

```
Switch(config)#int range f0/23-24
Switch(config-if-range)#sw tr en dot
Switch(config-if-range)#sw mo tr


Switch(config-if-range)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/23, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/23, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan100, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan200, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed state to up

Switch(config-if-range)#
```

此时，与三层交换机相连的二层交换机对应的端口自动变为 trunk 模式。

5 配置二层交换机

为二层交换机添加 vlan100 与 vlan200，并将‘Switch 0’的 f0/1 端口分配给 vlan100，将‘Switch 0’的 f0/2 端口分配给 vlan200，将‘Switch 1’的 f0/1 端口分配给 vlan200。下图以‘Switch 0’为例：

Switch 0:

```
Switch>en
Switch#vlan database
Switch(vlan)#vlan 100
VLAN 100 added:
    Name: VLAN0100
Switch(vlan)#vlan 200
VLAN 200 added:
    Name: VLAN0200
Switch(vlan)#ex
APPLY completed.
Exiting....
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int f0/1
Switch(config-if)#sw acc vlan 100
Switch(config-if)#ex
Switch(config)#interface FastEthernet0/2
Switch(config-if)#switchport access vlan 200
Switch(config-if)#ex
Switch(config)#
```

Switch 1:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#interface FastEthernet0/1
Switch(config-if)#
Switch(config-if)#
Switch(config-if)#switchport access vlan 100
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/1
Switch(config-if)#
```

6 测试网络连通性

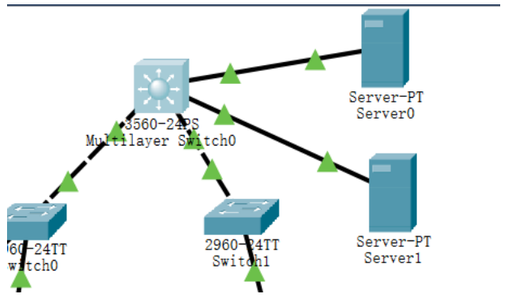
查看三层交换机的路由表：

```
Switch#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

     100.0.0.0/24 is subnetted, 1 subnets
C       100.100.100.0 is directly connected, Loopback0
     172.16.0.0/17 is subnetted, 2 subnets
C       172.16.0.0 is directly connected, Vlan100
C       172.16.128.0 is directly connected, Vlan200
```

```
Packet Tracer PC Command Line 1.0
C:\>ping 100.100.100.100

Pinging 100.100.100.100 with 32 bytes of data:

Reply from 100.100.100.100: bytes=32 time<1ms TTL=255
Reply from 100.100.100.100: bytes=32 time<1ms TTL=255
Reply from 100.100.100.100: bytes=32 time<1ms TTL=255
Reply from 100.100.100.100: bytes=32 time=5ms TTL=255

Ping statistics for 100.100.100.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 5ms, Average = 1ms

C:\>ping 172.16.128.100

Pinging 172.16.128.100 with 32 bytes of data:

Request timed out.
Reply from 172.16.128.100: bytes=32 time<1ms TTL=127
Reply from 172.16.128.100: bytes=32 time<1ms TTL=127
Reply from 172.16.128.100: bytes=32 time=1ms TTL=127
```

```
C:\>ping 172.16.129.100

Pinging 172.16.129.100 with 32 bytes of data:

Reply from 172.16.129.100: bytes=32 time<1ms TTL=127
Reply from 172.16.129.100: bytes=32 time<1ms TTL=127
Reply from 172.16.129.100: bytes=32 time<1ms TTL=127
Reply from 172.16.129.100: bytes=32 time<1ms TTL=127

Ping statistics for 172.16.129.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

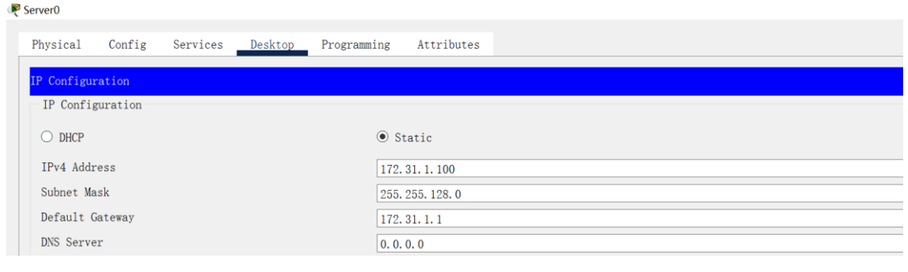
3) 熟悉 DNS 服务器与 HTTP 服务器的配置



1 添加两台服务器，将其连接到三层交换机上，并如图所示配置 IP 地址，三层交换机对应端口配置如下(以 f0/10 为例)：

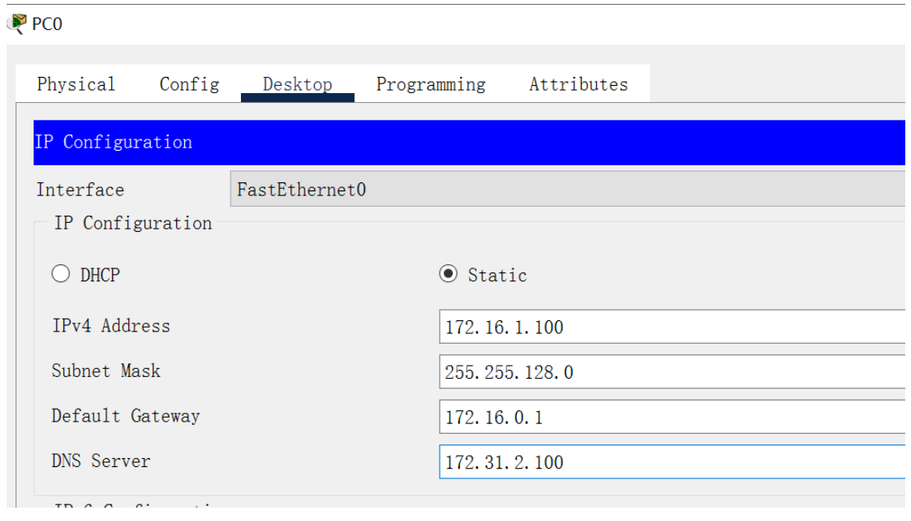
```
Switch>enable
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int f0/10
Switch(config-if)#no sw
Switch(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/10, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/10, changed state to up

Switch(config-if)#ip add 172.31.1.1 255.255.255.0
Switch(config-if)#no shutdown
Switch(config-if)#ex
Switch(config)#int f0/11
Switch(config-if)#no sw
Switch(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/11, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/11, changed state to up

Switch(config-if)#ip add 172.31.2.1 255.255.255.0
Switch(config-if)#no shut
Switch(config-if)#exit
Switch(config)#
```

2　配置 HTTP 服务器，进入服务器配置界面，开启 HTTP 服务，并添加一个 HTML 静态页面，内容可自由编写，注意网页的编写只支持英文。如下图所示：

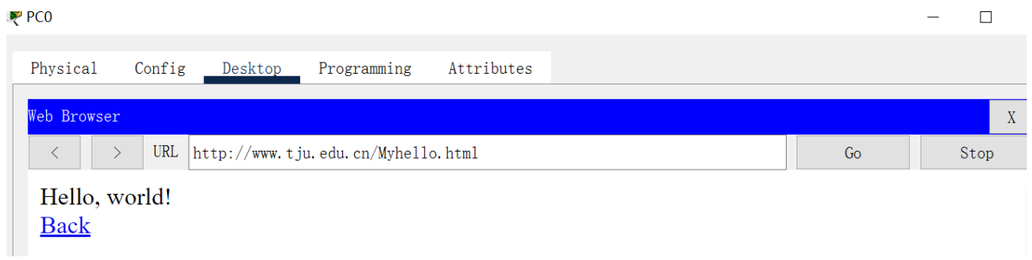


3　配置 DNS 服务器，进入服务器配置界面，开启 DNS 服务，并添加一条 IP 为 172.31.1.100 到域名 www.tju.edu.cn 的 DNS 映射，如下如所示：

4 为 PC0 添加 DNS 服务器地址，如下图所示：



5 测试 DNS 服务与 HTTP 服务是否正常

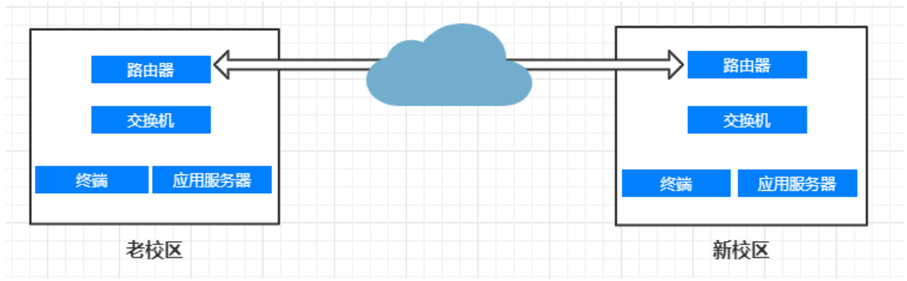


DNS lookup 命令查看 HTTP 服务器 IP 和域名

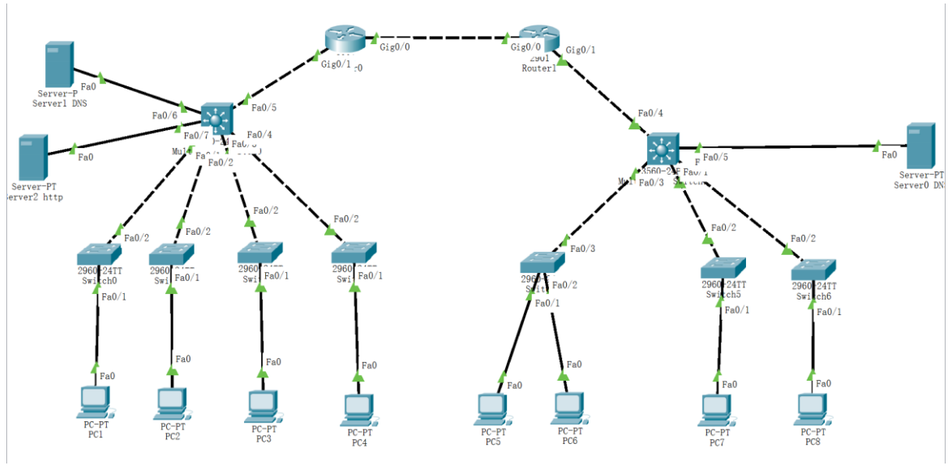
```
C:\>nslookup www.tju.edu.cn

Server: [172.31.2.100]
Address:  172.31.2.100

Non-authoritative answer:
Name:    www.tju.edu.cn
Address:   172.31.1.100
```

4) 设计并模拟实现天津大学两个校区之间的校园网连接

建立如下网络拓扑并正确配置路由器、交换机、应用服务器的参数，两个校区的 PC 可相互访问，两个校区的 PC 均可通过域名访问放在老校区的 HTML 页面，在新校区 PC 上使用 DNS Lookup 命令查看 HTTP 服务器的 IP 和域名，并用 Trace Route 命令查看访问 HTTP 服务器所经过的路由。查看路由器上的路由表。



网络拓扑图：



老校区：172.16.0.1/16 ~ 172.16.254.254/16
学院 1：172.16.0.1/21 ~ 172.16..7.254/21
学院 2：172.16.128.1/20 ~ 172.16.143.254/20
学院 3：172.16.192.1/20 ~ 172.16.207.254/20
学院 4：172.16.224.1/19 ~ 172.16.254.254/19

老校区：172.17.0.1/16 ~ 172.17.254.254/16
学院 5：172.17.0.1/22 ~ 172.17.3.254/22
学院 6：172.17.128.1/21 ~ 172.17.135.254/21
学院 7：172.17.192.1/20 ~ 172.17.207.254/20
学院 8：172.17.224.1/19 ~ 172.17.254.254/19

1 首先配置两个路由器的 IP 地址和 mask
2 配置 PC 的 IP 地址，mask，gateway
3 配置三层交换机的 loopback，这个配置与否对于本实验没有影响
4 在三层交换机中建立 VLAN，其中左侧的三册交换机的 VLAN 有 100，200，300，400.右侧的三层交换的 VLAN 有 500，600，700，800.
5 为建立的 VLAN 分配 IP 地址
6 为两个三层交换机配置 RIP 路由协议，使得三层交换机所连接的所有 PC 所在的子网能够和外网连接
7 配置两个路由器的 RIP 协议
8 配置三层交换机对于服务器的接口的 IP 地址
9 配置服务器的 IP 地址，子网掩码和网关
10 配置 DNS 服务器和 HTTP 服务器

PC1:

```
Device Name: PC1
Device Model: PC-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.16.1.100/21    <not set>                                 0040.0B82.C733
Bluetooth       Down   <not set>          <not set>                                 0001.C97E.6D52

Gateway: 172.16.0.1
DNS Server: 172.31.2.100
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > PC1
```

PC2:

```
Device Name: PC2
Device Model: PC-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.16.128.100/20  <not set>                                 0000.0C34.17C9
Bluetooth       Down   <not set>          <not set>                                 0001.4359.264B

Gateway: 172.16.128.1
DNS Server: 172.31.2.100
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > PC2
```

PC3:

```
Device Name: PC3
Device Model: PC-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.16.192.100/20  <not set>                                 0004.9AAD.EE77
Bluetooth       Down   <not set>          <not set>                                 0001.43D2.AD78

Gateway: 172.16.192.1
DNS Server: 172.31.2.100
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > PC3
```

PC4:

```
Device Name: PC4
Device Model: PC-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.16.224.100/19  <not set>                                 0050.0F26.7C66
Bluetooth       Down   <not set>          <not set>                                 00E0.F925.14BC

Gateway: 172.16.224.1
DNS Server: 172.31.2.100
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > PC4
```

PC5:

```
Device Name: PC5
Device Model: PC-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.17.1.100/22    <not set>                                 0001.637E.25CE
Bluetooth       Down   <not set>          <not set>                                 0001.97CA.5B18

Gateway: 172.17.0.1
DNS Server: 172.32.0.2
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > PC5
```

PC6:

```
Device Name: PC6
Device Model: PC-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.17.128.100/21  <not set>                                 0002.4AAC.197C
Bluetooth       Down   <not set>          <not set>                                 0090.21CB.B2D6

Gateway: 172.17.128.1
DNS Server: 172.32.0.2
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > PC6
```

PC7:

```
Device Name: PC7
Device Model: PC-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.17.192.100/20  <not set>                                 00E0.B098.2C6D
Bluetooth       Down   <not set>          <not set>                                 00D0.BCE5.C98A

Gateway: 172.17.192.1
DNS Server: 172.32.0.2
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > PC7
```

PC8:

```
Device Name: PC8
Device Model: PC-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.17.224.100/19  <not set>                                 0050.0FB1.9267
Bluetooth       Down   <not set>          <not set>                                 000A.F393.D086

Gateway: 172.17.224.1
DNS Server: 172.32.0.2
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > PC8
```

三层交换机配置 VLAN

```
Switch(vlan)#vlan 100
VLAN 100 added:
    Name: VLAN0100
Switch(vlan)#vlan 200
VLAN 200 added:
    Name: VLAN0200
Switch(vlan)#vlan 300
VLAN 300 added:
    Name: VLAN0300
Switch(vlan)#vlan 400
VLAN 400 added:
    Name: VLAN0400
Switch(vlan)#
```

```
Switch(vlan)#vlan 500
VLAN 500 added:
    Name: VLAN0500
Switch(vlan)#vlan 600
VLAN 600 added:
    Name: VLAN0600
Switch(vlan)#vlan 700
VLAN 700 added:
    Name: VLAN0700
Switch(vlan)#vlan 800
VLAN 800 added:
    Name: VLAN0800
Switch(vlan)#
```

Switch0:

```
Device Name: Switch0
Custom Device Model: 2960 IOS15
Hostname: Switch

Port                Link   VLAN   IP Address          MAC Address
FastEthernet0/1     Up     100    --                  0000.0C8C.7801
FastEthernet0/2     Up     --     --                  0000.0C8C.7802
FastEthernet0/3     Down   1      --                  0000.0C8C.7803
FastEthernet0/4     Down   1      --                  0000.0C8C.7804
FastEthernet0/5     Down   1      --                  0000.0C8C.7805
FastEthernet0/6     Down   1      --                  0000.0C8C.7806
FastEthernet0/7     Down   1      --                  0000.0C8C.7807
FastEthernet0/8     Down   1      --                  0000.0C8C.7808
FastEthernet0/9     Down   1      --                  0000.0C8C.7809
FastEthernet0/10    Down   1      --                  0000.0C8C.780A
FastEthernet0/11    Down   1      --                  0000.0C8C.780B
FastEthernet0/12    Down   1      --                  0000.0C8C.780C
FastEthernet0/13    Down   1      --                  0000.0C8C.780D
FastEthernet0/14    Down   1      --                  0000.0C8C.780E
FastEthernet0/15    Down   1      --                  0000.0C8C.780F
FastEthernet0/16    Down   1      --                  0000.0C8C.7810
FastEthernet0/17    Down   1      --                  0000.0C8C.7811
FastEthernet0/18    Down   1      --                  0000.0C8C.7812
FastEthernet0/19    Down   1      --                  0000.0C8C.7813
FastEthernet0/20    Down   1      --                  0000.0C8C.7814
FastEthernet0/21    Down   1      --                  0000.0C8C.7815
FastEthernet0/22    Down   1      --                  0000.0C8C.7816
FastEthernet0/23    Down   1      --                  0000.0C8C.7817
FastEthernet0/24    Down   1      --                  0000.0C8C.7818
GigabitEthernet0/1  Down   1      --                  0000.0C8C.7819
GigabitEthernet0/2  Down   1      --                  0000.0C8C.781A
Vlan1               Down   1      <not set>           00E0.8F3C.8DBE

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Switch0
```

Switch1:

```
Device Name: Switch1
Custom Device Model: 2960 IOS15
Hostname: Switch

Port                Link   VLAN   IP Address          MAC Address
FastEthernet0/1     Up     200    --                  0002.16C5.4201
FastEthernet0/2     Up     --     --                  0002.16C5.4202
FastEthernet0/3     Down   1      --                  0002.16C5.4203
FastEthernet0/4     Down   1      --                  0002.16C5.4204
FastEthernet0/5     Down   1      --                  0002.16C5.4205
FastEthernet0/6     Down   1      --                  0002.16C5.4206
FastEthernet0/7     Down   1      --                  0002.16C5.4207
FastEthernet0/8     Down   1      --                  0002.16C5.4208
FastEthernet0/9     Down   1      --                  0002.16C5.4209
FastEthernet0/10    Down   1      --                  0002.16C5.420A
FastEthernet0/11    Down   1      --                  0002.16C5.420B
FastEthernet0/12    Down   1      --                  0002.16C5.420C
FastEthernet0/13    Down   1      --                  0002.16C5.420D
FastEthernet0/14    Down   1      --                  0002.16C5.420E
FastEthernet0/15    Down   1      --                  0002.16C5.420F
FastEthernet0/16    Down   1      --                  0002.16C5.4210
FastEthernet0/17    Down   1      --                  0002.16C5.4211
FastEthernet0/18    Down   1      --                  0002.16C5.4212
FastEthernet0/19    Down   1      --                  0002.16C5.4213
FastEthernet0/20    Down   1      --                  0002.16C5.4214
FastEthernet0/21    Down   1      --                  0002.16C5.4215
FastEthernet0/22    Down   1      --                  0002.16C5.4216
FastEthernet0/23    Down   1      --                  0002.16C5.4217
FastEthernet0/24    Down   1      --                  0002.16C5.4218
GigabitEthernet0/1  Down   1      --                  0002.16C5.4219
GigabitEthernet0/2  Down   1      --                  0002.16C5.421A
Vlan1               Down   1      <not set>           000C.CF95.8E10

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Switch1
```

Switch2:

```
Device Name: Switch2
Custom Device Model: 2960 IOS15
Hostname: Switch

Port                Link   VLAN   IP Address          MAC Address
FastEthernet0/1     Up     300    --                  00D0.97A5.2301
FastEthernet0/2     Up     --     --                  00D0.97A5.2302
FastEthernet0/3     Down   1      --                  00D0.97A5.2303
FastEthernet0/4     Down   1      --                  00D0.97A5.2304
FastEthernet0/5     Down   1      --                  00D0.97A5.2305
FastEthernet0/6     Down   1      --                  00D0.97A5.2306
FastEthernet0/7     Down   1      --                  00D0.97A5.2307
FastEthernet0/8     Down   1      --                  00D0.97A5.2308
FastEthernet0/9     Down   1      --                  00D0.97A5.2309
FastEthernet0/10    Down   1      --                  00D0.97A5.230A
FastEthernet0/11    Down   1      --                  00D0.97A5.230B
FastEthernet0/12    Down   1      --                  00D0.97A5.230C
FastEthernet0/13    Down   1      --                  00D0.97A5.230D
FastEthernet0/14    Down   1      --                  00D0.97A5.230E
FastEthernet0/15    Down   1      --                  00D0.97A5.230F
FastEthernet0/16    Down   1      --                  00D0.97A5.2310
FastEthernet0/17    Down   1      --                  00D0.97A5.2311
FastEthernet0/18    Down   1      --                  00D0.97A5.2312
FastEthernet0/19    Down   1      --                  00D0.97A5.2313
FastEthernet0/20    Down   1      --                  00D0.97A5.2314
FastEthernet0/21    Down   1      --                  00D0.97A5.2315
FastEthernet0/22    Down   1      --                  00D0.97A5.2316
FastEthernet0/23    Down   1      --                  00D0.97A5.2317
FastEthernet0/24    Down   1      --                  00D0.97A5.2318
GigabitEthernet0/1  Down   1      --                  00D0.97A5.2319
GigabitEthernet0/2  Down   1      --                  00D0.97A5.231A
Vlan1               Down   1      <not set>           00E0.F989.3652

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Switch2
```

Switch3:

```
Device Name: Switch3
Custom Device Model: 2960 IOS15
Hostname: Switch

Port                Link   VLAN   IP Address          MAC Address
FastEthernet0/1     Up     400    --                  0030.F2C4.B301
FastEthernet0/2     Up     --     --                  0030.F2C4.B302
FastEthernet0/3     Down   1      --                  0030.F2C4.B303
FastEthernet0/4     Down   1      --                  0030.F2C4.B304
FastEthernet0/5     Down   1      --                  0030.F2C4.B305
FastEthernet0/6     Down   1      --                  0030.F2C4.B306
FastEthernet0/7     Down   1      --                  0030.F2C4.B307
FastEthernet0/8     Down   1      --                  0030.F2C4.B308
FastEthernet0/9     Down   1      --                  0030.F2C4.B309
FastEthernet0/10    Down   1      --                  0030.F2C4.B30A
FastEthernet0/11    Down   1      --                  0030.F2C4.B30B
FastEthernet0/12    Down   1      --                  0030.F2C4.B30C
FastEthernet0/13    Down   1      --                  0030.F2C4.B30D
FastEthernet0/14    Down   1      --                  0030.F2C4.B30E
FastEthernet0/15    Down   1      --                  0030.F2C4.B30F
FastEthernet0/16    Down   1      --                  0030.F2C4.B310
FastEthernet0/17    Down   1      --                  0030.F2C4.B311
FastEthernet0/18    Down   1      --                  0030.F2C4.B312
FastEthernet0/19    Down   1      --                  0030.F2C4.B313
FastEthernet0/20    Down   1      --                  0030.F2C4.B314
FastEthernet0/21    Down   1      --                  0030.F2C4.B315
FastEthernet0/22    Down   1      --                  0030.F2C4.B316
FastEthernet0/23    Down   1      --                  0030.F2C4.B317
FastEthernet0/24    Down   1      --                  0030.F2C4.B318
GigabitEthernet0/1  Down   1      --                  0030.F2C4.B319
GigabitEthernet0/2  Down   1      --                  0030.F2C4.B31A
Vlan1               Down   1      <not set>           0002.167A.33A9

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Switch3
```

Switch4:

```
Device Name: Switch4
Custom Device Model: 2960 IOS15
Hostname: Switch

Port                Link   VLAN   IP Address          MAC Address
FastEthernet0/1     Up     500    --                  00D0.FFBD.2D01
FastEthernet0/2     Up     600    --                  00D0.FFBD.2D02
FastEthernet0/3     Up     --     --                  00D0.FFBD.2D03
FastEthernet0/4     Down   1      --                  00D0.FFBD.2D04
FastEthernet0/5     Down   1      --                  00D0.FFBD.2D05
FastEthernet0/6     Down   1      --                  00D0.FFBD.2D06
FastEthernet0/7     Down   1      --                  00D0.FFBD.2D07
FastEthernet0/8     Down   1      --                  00D0.FFBD.2D08
FastEthernet0/9     Down   1      --                  00D0.FFBD.2D09
FastEthernet0/10    Down   1      --                  00D0.FFBD.2D0A
FastEthernet0/11    Down   1      --                  00D0.FFBD.2D0B
FastEthernet0/12    Down   1      --                  00D0.FFBD.2D0C
FastEthernet0/13    Down   1      --                  00D0.FFBD.2D0D
FastEthernet0/14    Down   1      --                  00D0.FFBD.2D0E
FastEthernet0/15    Down   1      --                  00D0.FFBD.2D0F
FastEthernet0/16    Down   1      --                  00D0.FFBD.2D10
FastEthernet0/17    Down   1      --                  00D0.FFBD.2D11
FastEthernet0/18    Down   1      --                  00D0.FFBD.2D12
FastEthernet0/19    Down   1      --                  00D0.FFBD.2D13
FastEthernet0/20    Down   1      --                  00D0.FFBD.2D14
FastEthernet0/21    Down   1      --                  00D0.FFBD.2D15
FastEthernet0/22    Down   1      --                  00D0.FFBD.2D16
FastEthernet0/23    Down   1      --                  00D0.FFBD.2D17
FastEthernet0/24    Down   1      --                  00D0.FFBD.2D18
GigabitEthernet0/1  Down   1      --                  00D0.FFBD.2D19
GigabitEthernet0/2  Down   1      --                  00D0.FFBD.2D1A
Vlan1               Down   1      <not set>           0001.C7D0.07D5

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Switch4
```

Switch5:

```
Device Name: Switch5
Custom Device Model: 2960 IOS15
Hostname: Switch

Port                Link   VLAN   IP Address          MAC Address
FastEthernet0/1     Up     700    --                  0001.644E.4501
FastEthernet0/2     Up     --     --                  0001.644E.4502
FastEthernet0/3     Down   1      --                  0001.644E.4503
FastEthernet0/4     Down   1      --                  0001.644E.4504
FastEthernet0/5     Down   1      --                  0001.644E.4505
FastEthernet0/6     Down   1      --                  0001.644E.4506
FastEthernet0/7     Down   1      --                  0001.644E.4507
FastEthernet0/8     Down   1      --                  0001.644E.4508
FastEthernet0/9     Down   1      --                  0001.644E.4509
FastEthernet0/10    Down   1      --                  0001.644E.450A
FastEthernet0/11    Down   1      --                  0001.644E.450B
FastEthernet0/12    Down   1      --                  0001.644E.450C
FastEthernet0/13    Down   1      --                  0001.644E.450D
FastEthernet0/14    Down   1      --                  0001.644E.450E
FastEthernet0/15    Down   1      --                  0001.644E.450F
FastEthernet0/16    Down   1      --                  0001.644E.4510
FastEthernet0/17    Down   1      --                  0001.644E.4511
FastEthernet0/18    Down   1      --                  0001.644E.4512
FastEthernet0/19    Down   1      --                  0001.644E.4513
FastEthernet0/20    Down   1      --                  0001.644E.4514
FastEthernet0/21    Down   1      --                  0001.644E.4515
FastEthernet0/22    Down   1      --                  0001.644E.4516
FastEthernet0/23    Down   1      --                  0001.644E.4517
FastEthernet0/24    Down   1      --                  0001.644E.4518
GigabitEthernet0/1  Down   1      --                  0001.644E.4519
GigabitEthernet0/2  Down   1      --                  0001.644E.451A
Vlan1               Down   1      <not set>           0001.97B8.8A2C

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Switch5
```

Switch6:

```
Device Name: Switch6
Custom Device Model: 2960 IOS15
Hostname: Switch

Port                Link   VLAN   IP Address          MAC Address
FastEthernet0/1     Up     800    --                  00D0.FFE1.C501
FastEthernet0/2     Up     --     --                  00D0.FFE1.C502
FastEthernet0/3     Down   1      --                  00D0.FFE1.C503
FastEthernet0/4     Down   1      --                  00D0.FFE1.C504
FastEthernet0/5     Down   1      --                  00D0.FFE1.C505
FastEthernet0/6     Down   1      --                  00D0.FFE1.C506
FastEthernet0/7     Down   1      --                  00D0.FFE1.C507
FastEthernet0/8     Down   1      --                  00D0.FFE1.C508
FastEthernet0/9     Down   1      --                  00D0.FFE1.C509
FastEthernet0/10    Down   1      --                  00D0.FFE1.C50A
FastEthernet0/11    Down   1      --                  00D0.FFE1.C50B
FastEthernet0/12    Down   1      --                  00D0.FFE1.C50C
FastEthernet0/13    Down   1      --                  00D0.FFE1.C50D
FastEthernet0/14    Down   1      --                  00D0.FFE1.C50E
FastEthernet0/15    Down   1      --                  00D0.FFE1.C50F
FastEthernet0/16    Down   1      --                  00D0.FFE1.C510
FastEthernet0/17    Down   1      --                  00D0.FFE1.C511
FastEthernet0/18    Down   1      --                  00D0.FFE1.C512
FastEthernet0/19    Down   1      --                  00D0.FFE1.C513
FastEthernet0/20    Down   1      --                  00D0.FFE1.C514
FastEthernet0/21    Down   1      --                  00D0.FFE1.C515
FastEthernet0/22    Down   1      --                  00D0.FFE1.C516
FastEthernet0/23    Down   1      --                  00D0.FFE1.C517
FastEthernet0/24    Down   1      --                  00D0.FFE1.C518
GigabitEthernet0/1  Down   1      --                  00D0.FFE1.C519
GigabitEthernet0/2  Down   1      --                  00D0.FFE1.C51A
Vlan1               Down   1      <not set>           00E0.B0C0.45AE

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Switch6
```

三层交换机 **1**：

```
Device Name: Multilayer Switch0
Device Model: 3560-24PS
Hostname: Switch

Port                Link   VLAN   IP Address          IPv6 Address                              MAC Address
FastEthernet0/1     Up     --     <not set>           <not set>                                 0060.5CEA.5D01
FastEthernet0/2     Up     --     <not set>           <not set>                                 0060.5CEA.5D02
FastEthernet0/3     Up     --     <not set>           <not set>                                 0060.5CEA.5D03
FastEthernet0/4     Up     --     <not set>           <not set>                                 0060.5CEA.5D04
FastEthernet0/5     Up     1      172.40.9.1/16       <not set>                                 0060.5CEA.5D05
FastEthernet0/6     Up     1      172.31.2.1/24       <not set>                                 0060.5CEA.5D06
FastEthernet0/7     Up     1      172.31.1.1/24       <not set>                                 0060.5CEA.5D07
FastEthernet0/8     Down   1      <not set>           <not set>                                 0060.5CEA.5D08
FastEthernet0/9     Down   1      <not set>           <not set>                                 0060.5CEA.5D09
FastEthernet0/10    Down   1      <not set>           <not set>                                 0060.5CEA.5D0A
FastEthernet0/11    Down   1      <not set>           <not set>                                 0060.5CEA.5D0B
FastEthernet0/12    Down   1      <not set>           <not set>                                 0060.5CEA.5D0C
FastEthernet0/13    Down   1      <not set>           <not set>                                 0060.5CEA.5D0D
FastEthernet0/14    Down   1      <not set>           <not set>                                 0060.5CEA.5D0E
FastEthernet0/15    Down   1      <not set>           <not set>                                 0060.5CEA.5D0F
FastEthernet0/16    Down   1      <not set>           <not set>                                 0060.5CEA.5D10
FastEthernet0/17    Down   1      <not set>           <not set>                                 0060.5CEA.5D11
FastEthernet0/18    Down   1      <not set>           <not set>                                 0060.5CEA.5D12
FastEthernet0/19    Down   1      <not set>           <not set>                                 0060.5CEA.5D13
FastEthernet0/20    Down   1      <not set>           <not set>                                 0060.5CEA.5D14
FastEthernet0/21    Down   1      <not set>           <not set>                                 0060.5CEA.5D15
FastEthernet0/22    Down   1      <not set>           <not set>                                 0060.5CEA.5D16
FastEthernet0/23    Down   1      <not set>           <not set>                                 0060.5CEA.5D17
FastEthernet0/24    Down   1      <not set>           <not set>                                 0060.5CEA.5D18
GigabitEthernet0/1  Down   1      <not set>           <not set>                                 0060.5CEA.5D19
GigabitEthernet0/2  Down   1      <not set>           <not set>                                 0060.5CEA.5D1A
Loopback0           Up     --     100.100.100.100/24  <not set>                                 000A.4121.7B45
Vlan1               Down   1      <not set>           <not set>                                 0010.11BC.B90A
Vlan100             Up     100    172.16.0.1/21       <not set>                                 0010.11BC.B901
Vlan200             Up     200    172.16.128.1/20     <not set>                                 0010.11BC.B902
Vlan300             Up     300    172.16.192.1/20     <not set>                                 0010.11BC.B903
Vlan400             Up     400    172.16.244.1/19     <not set>                                 0010.11BC.B904

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Multilayer Switch0
```

三层交换机 **2**

```
Device Name: Multilayer Switch1
Device Model: 3560-24PS
Hostname: Switch

Port                Link   VLAN   IP Address          IPv6 Address                              MAC Address
FastEthernet0/1     Up     --     <not set>           <not set>                                 00D0.D371.9201
FastEthernet0/2     Up     --     <not set>           <not set>                                 00D0.D371.9202
FastEthernet0/3     Up     --     <not set>           <not set>                                 00D0.D371.9203
FastEthernet0/4     Up     1      172.30.9.1/16       <not set>                                 00D0.D371.9204
FastEthernet0/5     Up     1      172.32.0.1/24       <not set>                                 00D0.D371.9205
FastEthernet0/6     Down   1      <not set>           <not set>                                 00D0.D371.9206
FastEthernet0/7     Down   1      <not set>           <not set>                                 00D0.D371.9207
FastEthernet0/8     Down   1      <not set>           <not set>                                 00D0.D371.9208
FastEthernet0/9     Down   1      <not set>           <not set>                                 00D0.D371.9209
FastEthernet0/10    Down   1      <not set>           <not set>                                 00D0.D371.920A
FastEthernet0/11    Down   1      <not set>           <not set>                                 00D0.D371.920B
FastEthernet0/12    Down   1      <not set>           <not set>                                 00D0.D371.920C
FastEthernet0/13    Down   1      <not set>           <not set>                                 00D0.D371.920D
FastEthernet0/14    Down   1      <not set>           <not set>                                 00D0.D371.920E
FastEthernet0/15    Down   1      <not set>           <not set>                                 00D0.D371.920F
FastEthernet0/16    Down   1      <not set>           <not set>                                 00D0.D371.9210
FastEthernet0/17    Down   1      <not set>           <not set>                                 00D0.D371.9211
FastEthernet0/18    Down   1      <not set>           <not set>                                 00D0.D371.9212
FastEthernet0/19    Down   1      <not set>           <not set>                                 00D0.D371.9213
FastEthernet0/20    Down   1      <not set>           <not set>                                 00D0.D371.9214
FastEthernet0/21    Down   1      <not set>           <not set>                                 00D0.D371.9215
FastEthernet0/22    Down   1      <not set>           <not set>                                 00D0.D371.9216
FastEthernet0/23    Down   1      <not set>           <not set>                                 00D0.D371.9217
FastEthernet0/24    Down   1      <not set>           <not set>                                 00D0.D371.9218
GigabitEthernet0/1  Down   1      <not set>           <not set>                                 00D0.D371.9219
GigabitEthernet0/2  Down   1      <not set>           <not set>                                 00D0.D371.921A
Loopback0           Up     --     101.101.101.101/24  <not set>                                 00D0.9753.1534
Vlan1               Down   1      <not set>           <not set>                                 0060.5C2E.16AE
Vlan500             Up     500    172.17.0.1/22       <not set>                                 0060.5C2E.1601
Vlan600             Up     600    172.17.128.1/21     <not set>                                 0060.5C2E.1602
Vlan700             Up     700    172.17.192.1/20     <not set>                                 0060.5C2E.1603
Vlan800             Up     800    172.17.224.1/19     <not set>                                 0060.5C2E.1604

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Multilayer Switch1
```

路由器 1：

```
Device Name: Router0
Device Model: 2901
Hostname: Router

Port                Link   VLAN   IP Address         IPv6 Address                              MAC Address
GigabitEthernet0/0  Up     --     10.10.1.1/8        <not set>                                 0001.96B9.0A01
GigabitEthernet0/1  Up     --     172.40.10.1/16     <not set>                                 0001.96B9.0A02
Vlan1               Down   1      <not set>          <not set>                                 00E0.F755.EA9E

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Router0
```

路由器 2：

```
Device Name: Router1
Device Model: 2901
Hostname: Router

Port                Link   VLAN   IP Address         IPv6 Address                              MAC Address
GigabitEthernet0/0  Up     --     10.10.1.2/8        <not set>                                 0050.0F56.3001
GigabitEthernet0/1  Up     --     172.30.10.1/16     <not set>                                 0050.0F56.3002
Vlan1               Down   1      <not set>          <not set>                                 000C.CF6A.50A6

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Router1
```

老校区 DNS：

```
Device Name: Server1 DNS
Device Model: Server-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.31.2.100/24    <not set>                                 00E0.B0BB.D709

Gateway: 172.31.2.1
DNS Server:  <not set>
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Server1 DNS
```

老校区 HTTP：

```
Device Name: Server2 http
Device Model: Server-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.31.1.100/24    <not set>                                 0000.0CAB.D99A

Gateway: 172.31.1.1
DNS Server:  <not set>
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Server2 http
```

新校区 DNS

```
Device Name: Server0 DNS
Device Model: Server-PT

Port            Link   IP Address         IPv6 Address                              MAC Address
FastEthernet0   Up     172.32.0.2/24      <not set>                                 0001.975D.C811

Gateway: 172.32.0.1
DNS Server:  <not set>
Line Number:  <not set>

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Server0 DNS
```

测试：

由于老校区四台计算机的配置方法都一样，这里就只演示 PC1 -> PC2 的结果。如果能够 PING 通那么老校区内所有的 PC 都能够实现互联。

```
C:\>ping 172.16.128.100

Pinging 172.16.128.100 with 32 bytes of data:

Reply from 172.16.128.100: bytes=32 time<1ms TTL=127
Reply from 172.16.128.100: bytes=32 time<1ms TTL=127
Reply from 172.16.128.100: bytes=32 time<1ms TTL=127
Reply from 172.16.128.100: bytes=32 time<1ms TTL=127

Ping statistics for 172.16.128.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

新校区内由于学院 5 和学院 6 是在一个路由器下，座椅这里演示 PC5 -> PC6，和 PC5 -> PC7 的结果，如果都能够通过，则说明，在新校区内所有的 PC 都可以互联。

```
C:\>ping 172.17.128.100

Pinging 172.17.128.100 with 32 bytes of data:

Reply from 172.17.128.100: bytes=32 time<1ms TTL=127
Reply from 172.17.128.100: bytes=32 time<1ms TTL=127
Reply from 172.17.128.100: bytes=32 time<1ms TTL=127
Reply from 172.17.128.100: bytes=32 time<1ms TTL=127

Ping statistics for 172.17.128.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\>ping 172.17.192.100

Pinging 172.17.192.100 with 32 bytes of data:

Reply from 172.17.192.100: bytes=32 time<1ms TTL=127
Reply from 172.17.192.100: bytes=32 time<1ms TTL=127
Reply from 172.17.192.100: bytes=32 time=9ms TTL=127
Reply from 172.17.192.100: bytes=32 time<1ms TTL=127

Ping statistics for 172.17.192.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 9ms, Average = 2ms
```

测试新校区和老校区之间的连通性

PC1 -> PC5

```
C:\>ping 172.17.1.100

Pinging 172.17.1.100 with 32 bytes of data:

Reply from 172.17.1.100: bytes=32 time<1ms TTL=124
Reply from 172.17.1.100: bytes=32 time<1ms TTL=124
Reply from 172.17.1.100: bytes=32 time<1ms TTL=124
Reply from 172.17.1.100: bytes=32 time<1ms TTL=124

Ping statistics for 172.17.1.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

PC2 -> PC6

```
C:\>ping 172.17.128.100

Pinging 172.17.128.100 with 32 bytes of data:

Reply from 172.17.128.100: bytes=32 time=15ms TTL=124
Reply from 172.17.128.100: bytes=32 time<1ms TTL=124
Reply from 172.17.128.100: bytes=32 time<1ms TTL=124
Reply from 172.17.128.100: bytes=32 time<1ms TTL=124

Ping statistics for 172.17.128.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 15ms, Average = 3ms
```

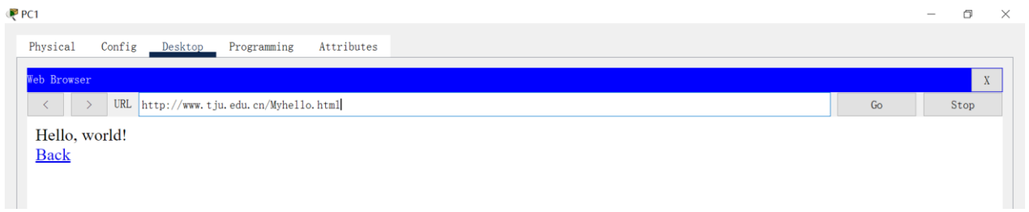
PC1 -> PC7

```
C:\>ping 172.17.192.100

Pinging 172.17.192.100 with 32 bytes of data:

Reply from 172.17.192.100: bytes=32 time<1ms TTL=124
Reply from 172.17.192.100: bytes=32 time<1ms TTL=124
Reply from 172.17.192.100: bytes=32 time<1ms TTL=124
Reply from 172.17.192.100: bytes=32 time<1ms TTL=124

Ping statistics for 172.17.192.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

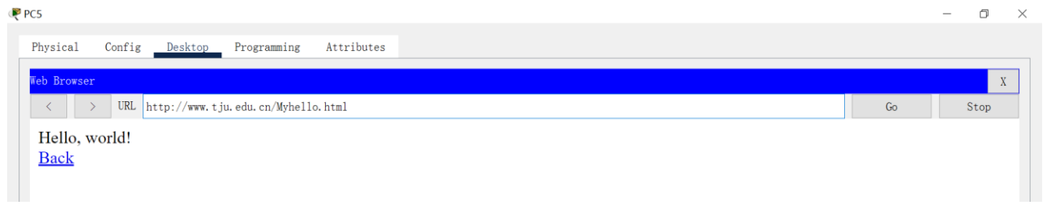
PC1 -> PC8

```
C:\>ping 172.17.224.100

Pinging 172.17.224.100 with 32 bytes of data:

Reply from 172.17.224.100: bytes=32 time<1ms TTL=124
Reply from 172.17.224.100: bytes=32 time=1ms TTL=124
Reply from 172.17.224.100: bytes=32 time<1ms TTL=124
Reply from 172.17.224.100: bytes=32 time=9ms TTL=124

Ping statistics for 172.17.224.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 9ms, Average = 2ms
```

老校区访问网页：



新校区访问网页：



实验感悟：

首先，实验中遇到了很多的问题。在一开始的时候，配置路由器只是配置了其中的一个网络 IP，没有配置两个，导致和 PC 端相连接的部分总是不通，后来把两个都配置完毕之后就解决了这个问题。

在给三层交换创建接口的 IP 地址的时候，总是说输入不符合规则。后来发现是没有加上 no switchport。这条命令的意思是：可以把二层接口改为三层接口，也就是说相当于一个路由器上的接口。no switch 实际上是 no switchport 的简写，而 switchport 就是交换口，也就是二层接口，这样 no 命令就意味着关闭二层接口并启用三层接口。

在配置路由器的时候，路由协议一定要是 version 2，不然回不通，这个给我搞蒙了。注意，这个实验中三层交换机的作用类似于路由器，在配置三层交换机的路由协议的的时候，如果是 RIP 协议，也一定要是 VERSION 2，不然会 PING 不通。

此外，在最后给新老校区配置完 DNS 服务器之后，没有给 PC 端配置 DNS 服务器的地址，导致一直 REQUEST TIMEOUT。

在这次实验中，更加了解了网络中的基本组成架构和对于这些架构的配置，对于子网的划分也有了更加深刻的理解。

教师签字：

年　月　日