**计算机网络实验报告**

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# 实验目的及实验功能(连通性说明)

使用了VLAN技术，使得vlan10虚拟局域网内的主机和路由器可以相互通讯；不同vlan间的主机和路由器不能 相互通讯。比如，PC0不能连通PC3

使用ACL访问控制技术，使PC1(192.168.1.2)不可以ping PC2，但是PC2可以ping PC1

使用PAT技术，PC4不能ping其它电脑，使得PC1可以ping PC4

所有路由使用OSPF

# 运用到的技术

VLAN路由连接Trunk技术

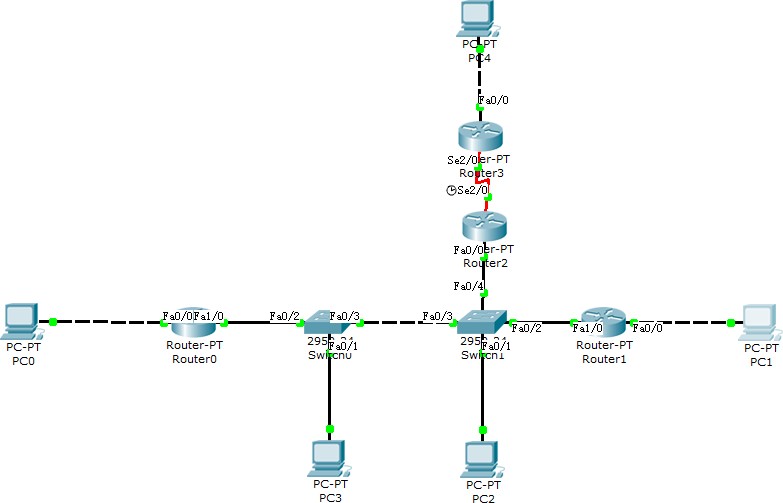
OSPF 算法

ACL配置

PAT动态地址转换技术

# 拓扑结构

## 逻辑拓扑图



* 1. **连线和配置详情：**

1. **连线详情**

R0[Fa0/0] —PC0，R0[Fa1/0] —S0[Fa0/2] R1[Fa0/0] —PC1，R1[Fa1/0] —S1[Fa0/2] R2[Fa0/0] —S1[Fa0/4]，R2[Se2/0] —R3[Se2/0] R3[Fa0/0] —PC4

S0[Fa0/3] —S1[Fa0/3]，S0[Fa0/1] —PC3 S1[Fa0/2] —PC2

1. **交换机连线**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Switch 名称** | **Fa 0/1** | **Fa 0/2** | **Fa 0/3** | **Fa 0/4** | **功能** |
| S0 | PC3 | R0 | S1 | 无 | trunk, VLAN |
| S1 | PC2 | R1 | S0 | R2 | trunk, VLAN |

1. **路由器配置**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Router 名称** | **Fa 0/0** | **Fa 1/0** | **Se 2/0** | **router-id** | **实现功能** |
| R0 | 192.168.0.1 | 10.0.0.1 | 未用 | 123.0.0.1 | OSPF |
| R1 | 192.168.1.1 | 10.0.0.2 | 未用 | 123.0.0.2 | OSPF, ACL |
| R2 | 10.0.0.3 | 无此接口 | 200.0.0.1 | 123.0.0.3 | OSPF |
| R3 | 200.0.0.2 | 无此接口 | 120.24.82.163 | 123.0.0.4 | OSPF, PAT |

1. **终端设备配置**

|  |  |  |  |
| --- | --- | --- | --- |
| **PC名称** | **IP** | **掩码** | **网关** |
| PC0 | 192.168.0.2 | 255.255.255.0 | 192.168.0.1 |
| PC1 | 192.168.1.2 | 255.255.255.0 | 192.168.1.1 |
| PC2 | 10.0.0.4 | 255.255.255.0 | 10.0.0.2 |
| PC3 | 10.0.0.5 | 255.255.255.0 | 10.0.0.2 |
| PC4 | 120.24.82.164 | 255.0.0.0 |  |

1. **实验过程**

**1.配置交换机**

* 1. **配置Swich0**

Switch>enable Switch#config terminal Switch#hostname S0

//create VLAN S0(config)#vlan 10 S0(config-vlan)#name one S0(config-vlan)#exit

//VLAN S0(config)#in f0/1

S0(config-if)#sw acc vlan 10

//trunk

S0(config-if)#in f0/3 S0(config-if)#sw mode tr

S0(config-if)#sw tr allowed vlan all

* 1. **配置Swich1**

Switch>enable Switch#config terminal Switch#hostname S1

//create VLAN S1(config)#vlan 10 S1(config-vlan)#name one S1(config-vlan)#exit

//VLAN S1(config)#in f0/1

S1(config-if)#sw acc vlan 10 S1(config-if)#in f0/2 S1(config-if)#sw acc vlan 10 S1(config-if)#in f0/4 S1(config-if)#sw acc vlan 10

//trunk

S1(config-if)#in f0/3 S1(config-if)#sw mode tr

S1(config-if)#sw tr allowed vlan all

**2.配置路由器**

* 1. **配置Router0**

Router>enable Router#config terminal Router(config)#hostname R0

//ip configuration R0(config)#int f0/0

R0(config-if)#ip address 192.168.0.1 255.255.255.0 R0(config-if)#no shut

R0(config-if)#int f1/0

R0(config-if)#ip address 10.0.0.1 255.255.255.0 R0(config-if)#no shut

R0(config-if)#exit

//ospf configuration R0(config)#router ospf 10

R0(config)#router-id 123.0.0.1

R0(config)#network 192.168.0.1 0.0.0.0 area 0

R0(config)#network 10.0.0.1 0.0.0.0 area 0

* 1. **配置Router1**

Router>enable Router#config terminal Router(config)#hostname R1

//ip configuration R1(config)#int f0/0

R1(config-if)#ip address 192.168.1.1 255.255.255.0 R1(config-if)#no shut

R1(config-if)#int f1/0

R1(config-if)#ip address 10.0.0.2 255.255.255.0 R1(config-if)#no shut

R1(config-if)#exit

//ospf configuration R1(config)#router ospf 10

R1(config)#router-id 123.0.0.2

R1(config)#network 192.168.1.1 0.0.0.0 area 0

R1(config)#network 10.0.0.2 0.0.0.0 area 0

//ACL

R1(config)# access-list 110 deny icmp 192.168.1.0 0.0.0.255 host 10.0.0.4 echo R1(config)# access-list 110 permit ip any any

R1(config)# int f0/0

R1(config-if)#ip access-group 110 in

* 1. **配置Router2**

Router>enable Router#config terminal Router(config)#hostname R2

//ip configuration R2(config)#int f0/0

R2(config-if)#ip address 10.0.0.3 255.255.255.0 R2(config-if)#no shut

R2(config-if)#int s2/0

R2(config-if)#ip address 200.0.0.1 255.255.255.0

R2(config-if)#clock rate 64000 R2(config-if)#no shut R2(config-if)#exit

//OSPF

R2(config)#router ospf 10

R2(config-router)#router-id 123.0.0.3

R2(config-router)# network 10.0.0.3 0.0.0.0 area 0

R2(config-router)# network 200.0.0.1 0.0.0.0 area 1

* 1. **配置Router3**

Router>enable Router#config terminal Router(config)#hostname R3

//ip configuration R3(config)#int s2/0

R3(config-if)#ip address 200.0.0.2 255.255.255.0 R3(config-if)#no shut

R3(config-if)#int f0/0

R3(config-if)#ip address 120.24.82.163 255.0.0.0 R3(config-if)#no shut

R3(config-if)#exit

//OSPF

R3(config)#router ospf 10

R3(config-router)#router-id 123.0.0.4

R3(config-router)# network 200.0.0.2 0.0.0.0 area 1

R3(config-router)# network 120.24.82.163 0.0.0.0 area 1 R3(config-router)# exit

//PAT

R3(config)#access-list 11 permit 192.168.0.0 0.0.255.255

R3(config)#access-list 11 permit 10.0.0.0 0.0.0.255

R3(config)#access-list 11 permit 200.0.0.0 0.0.0.255 R3(config)#ip nat inside source list 11 in f0/0 overload R3(config)#int s2/0

R3(config-if)#ip nat inside R3(config-if)#int f0/0 R3(config-if)#ip nat outside

**3.配置PC**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **IP** | **掩码** | **网关** |
| PC0 | 192.168.0.2 | 255.255.255.0 | 192.168.0.1 |
| PC1 | 192.168.1.2 | 255.255.255.0 | 192.168.1.1 |
| PC2 | 10.0.0.4 | 255.255.255.0 | 10.0.0.2 |
| PC3 | 10.0.0.5 | 255.255.255.0 | 10.0.0.2 |
| PC4 | 120.24.82.164 | 255.0.0.0 |  |

1. **注意事项**

交换机连接PC使用直通线，交换机连接路由器使用直通线，电脑连接路由器使用直通线 各设备连接接口状态灯正常显示，否则可能数据线连接松弛或脱落导致连接失败

若是路由器的两个以太网口同时灭灯，使用shut/no shut再次开启

配置设备的时候，PC0—R0，PC1—S0.S1，PC2—R1，PC3—R2，PC4—R3

# 命令附录

使用 show ip route查看路由信息，ping 检验各个网段间的连通性。使用以下指令查看路由表更新(每 30 秒更新一次)：

全局配置命令

router ospf <router-id>

接口配置命令

network <ipaddress> <wildcard-mask> area <area-id>

显示ip 路由协议参数

show ip protocols

显示接口的ospf 状态

show ip ospf interface

修改hello 间隔

ip ospf hello-interval <time>

修改dead 时间

ip ospf dead-interval <time>

配置ospf MD5 身份

ip ospf message-digest-key <key-id> md5 <key>

# 相关路由表信息

## R0

R0>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

10.0.0.0/24 is subnetted, 1 subnets

C 10.0.0.0 is directly connected, FastEthernet1/0

C 192.168.0.0/24 is directly connected, FastEthernet0/0

* 1. **R1**

R1>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

10.0.0.0/24 is subnetted, 1 subnets

C 10.0.0.0 is directly connected, FastEthernet1/0

O IA 120.0.0.0/8 [110/783] via 10.0.0.3, 00:14:12, FastEthernet1/0

C 192.168.1.0/24 is directly connected, FastEthernet0/0

O IA 200.0.0.0/24 [110/782] via 10.0.0.3, 00:16:38, FastEthernet1/0

* 1. **R2**

R2>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

10.0.0.0/24 is subnetted, 1 subnets

C 10.0.0.0 is directly connected, FastEthernet0/0

O 120.0.0.0/8 [110/782] via 200.0.0.2, 00:14:47, Serial2/0

O 192.168.1.0/24 [110/2] via 10.0.0.2, 00:18:30, FastEthernet0/0

C 200.0.0.0/24 is directly connected, Serial2/0

* 1. **R3**

R2>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

10.0.0.0/24 is subnetted, 1 subnets

C 10.0.0.0 is directly connected, FastEthernet0/0

O 120.0.0.0/8 [110/782] via 200.0.0.2, 00:14:47, Serial2/0

O 192.168.1.0/24 [110/2] via 10.0.0.2, 00:18:30, FastEthernet0/0

C 200.0.0.0/24 is directly connected, Serial2/0