

# 实验三 动态路由RIP&OSPF的配置

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# 动态路由协议

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- 动态路由协议的特点：

根据网络系统的运行情况，路由器根据每种协议对应的算法自动调整路由，并计算出最终的路由表。

- 动态路由协议根据所连接的网络规模大小可分为：

- 1 )距离矢量路由协议

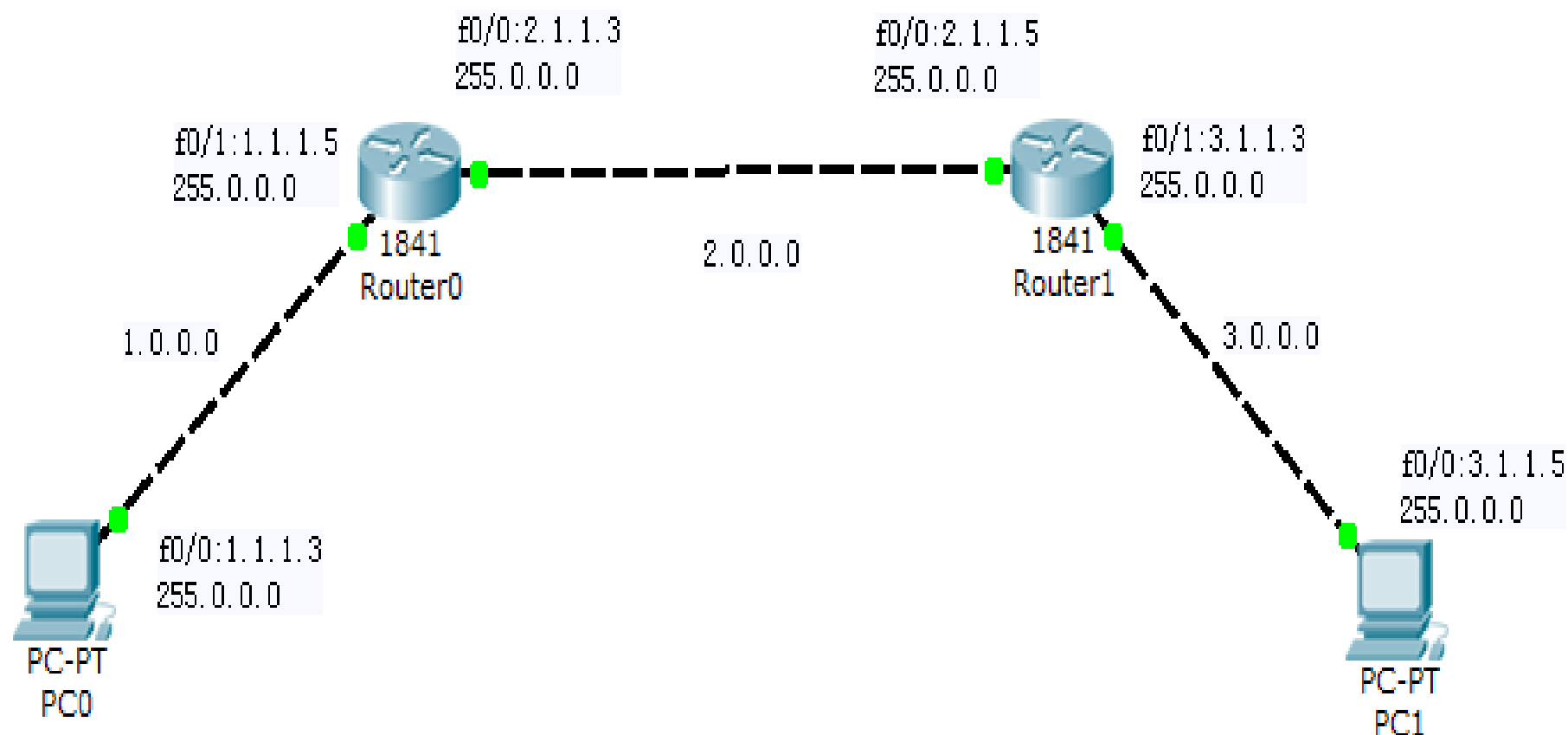
- 2 )链路状态路由协议

# 动态路由协议——RIP协议

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- **RIP**是最简单的距离矢量路由协议;
- **RIP**路由协议以”跳数”作为度量单位, 以计算路由;
- **RIP**路由协议优先选择“跳数”最少的路径作为最优路径
- **RIP**路由协议所支持得最大“跳数”为15。

# 路由器配置实例



# RIP协议的配置

- **RIP协议配置语法:**

**Router(config)#ip routing**

——启用**IP**路由协议

**Router(config)#router rip**

——启用**RIP**路由协议

**Router(config-router)#network** ×.×.×.× ——发布直连网段

**Router(config-router)#version 2** ——设置**RIP**协议版本号**2**

**Router(config-router)#end**

- **RIP协议删除语法**

**Router(config)# no router rip**

# RIP协议路由器配置实例

Router0配置过程:

Router>enable

Router#configure t

Router(config)#hostname Router0

Router0(config)#interface f0/0

Router0(config-if)#ip address 2.1.1.3 255.0.0.0

Router0(config-if)#no shutdown

Router0(config)#interface f0/1

Router0(config-if)#ip address 1.1.1.5 255.0.0.0

Router0(config-if)#no shutdown

Router0(config)#ip routing

Router0(config)#router rip

Router0(config-router)#network 1.0.0.0

Router0(config-router)#network 2.0.0.0

Router0(config-router)#version 2

Router0(config-router)#end

- 进入全局配置模式
- 更改路由器名字为Router0
- 进入f0/0端口
- 配置f0/0端口地址
- 启动f0/0端口
- 进入f0/1端口
- 配置f0/1端口地址
- 启动f0/1端口
- 启用ip路由协议
- 启用rip路由协议
- 发布直连网段
- 发布直连网段
- 设置rip版本号2

# RIP协议路由器配置实例

- Router0#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 1.0.0.0/8 is directly connected, FastEthernet0/1
- C 2.0.0.0/8 is directly connected, FastEthernet0/0
- R 3.0.0.0/8 [120/1] via 2.1.1.5, 00:00:13, FastEthernet0/0

# RIP协议路由器配置实例

Router1配置过程:

**Router>enable**

**Router#configure t**

**Router1(config)#hostname Router1**

**Router1(config)#interface f0/0**

**Router1(config-if)#ip address 2.1.1.5 255.0.0.0**

**Router1(config-if)#no shutdown**

**Router1(config)#interface f0/1**

**Router1(config-if)#ip address 3.1.1.3 255.0.0.0**

**Router1(config-if)#no shutdown**

**Router1(config)#ip routing**

**Router1(config)#router rip**

**Router1(config-router)#network 2.0.0.0**

**Router1(config-router)#network 3.0.0.0**

**Router1(config-router)#version 2**

**Router1(config-router)#end**

——进入全局配置模式

——更改路由器名字为**Router1**

——进入**f0/0**端口

——配置**f0/0**端口地址

——启动**f0/1**端口

——进入**f0/1**端口

——配置**f0/1**端口地址

——启动**f0/1**端口

——启用**ip**路由协议

——启用**rip**路由协议

——发布直连网段

——发布直连网段

——设置**rip**版本号**2**



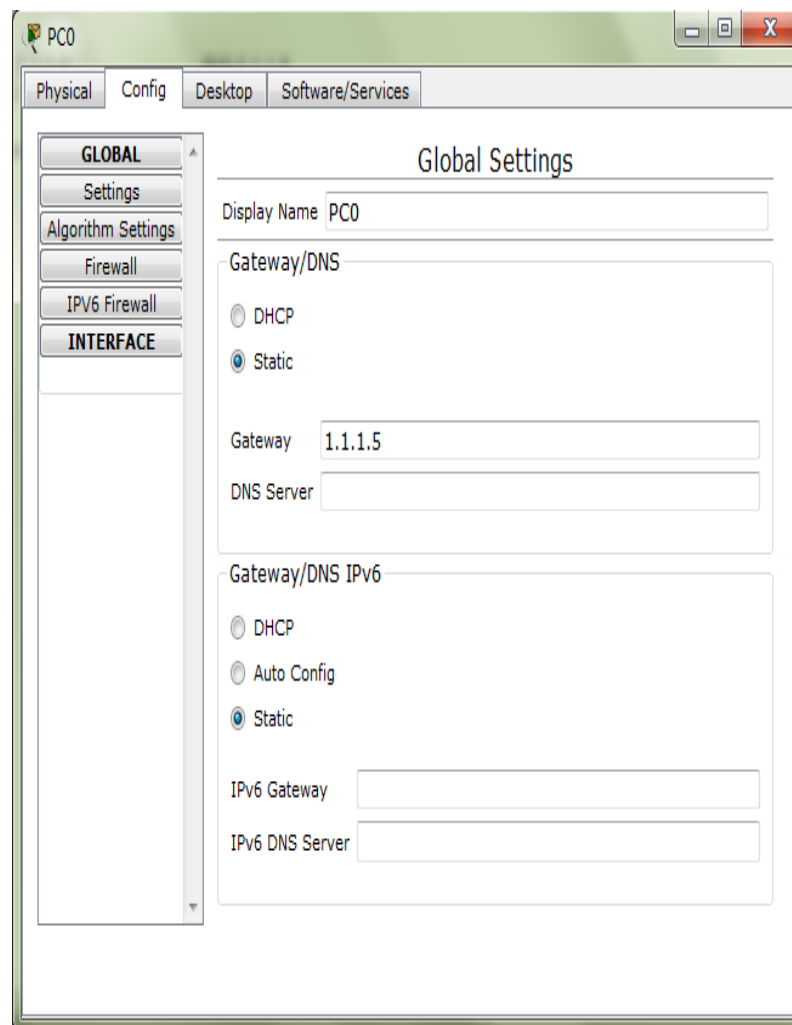
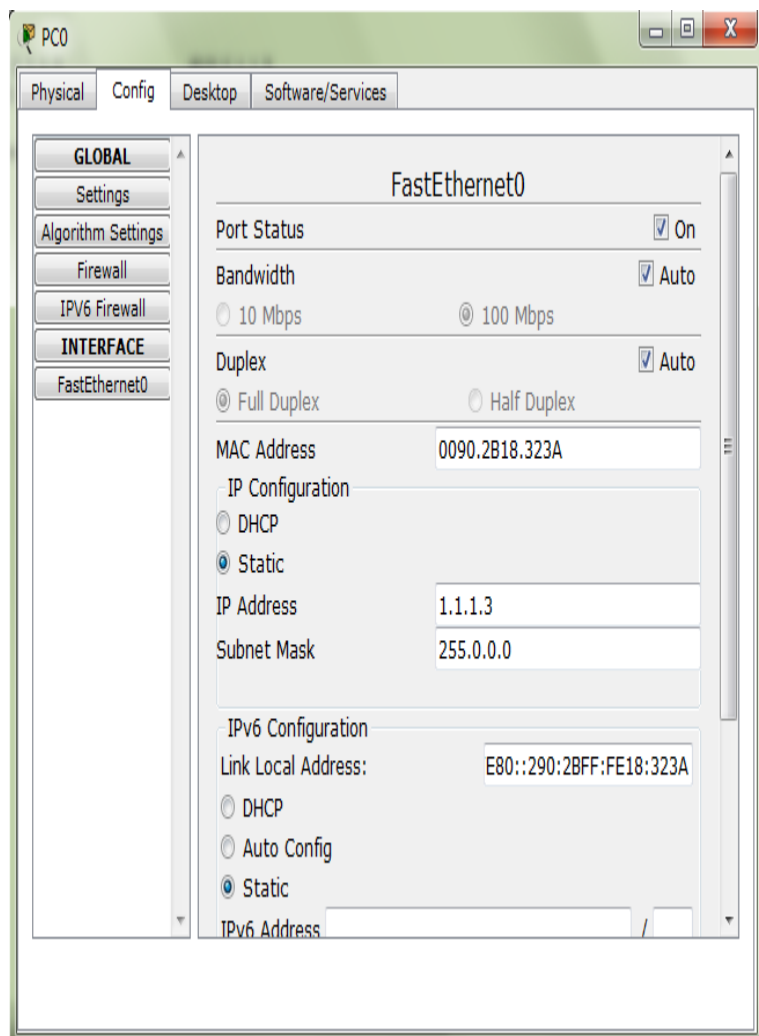
# RIP协议路由器配置实例

- 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
- 
- R 1.0.0.0/8 [120/1] via 2.1.1.3, 00:00:08, FastEthernet0/0
  - C 2.0.0.0/8 is directly connected, FastEthernet0/0
  - C 3.0.0.0/8 is directly connected, FastEthernet0/1

注意：RIP协议必须将网络内各路由器的RIP都配置完成才可以查看出结果

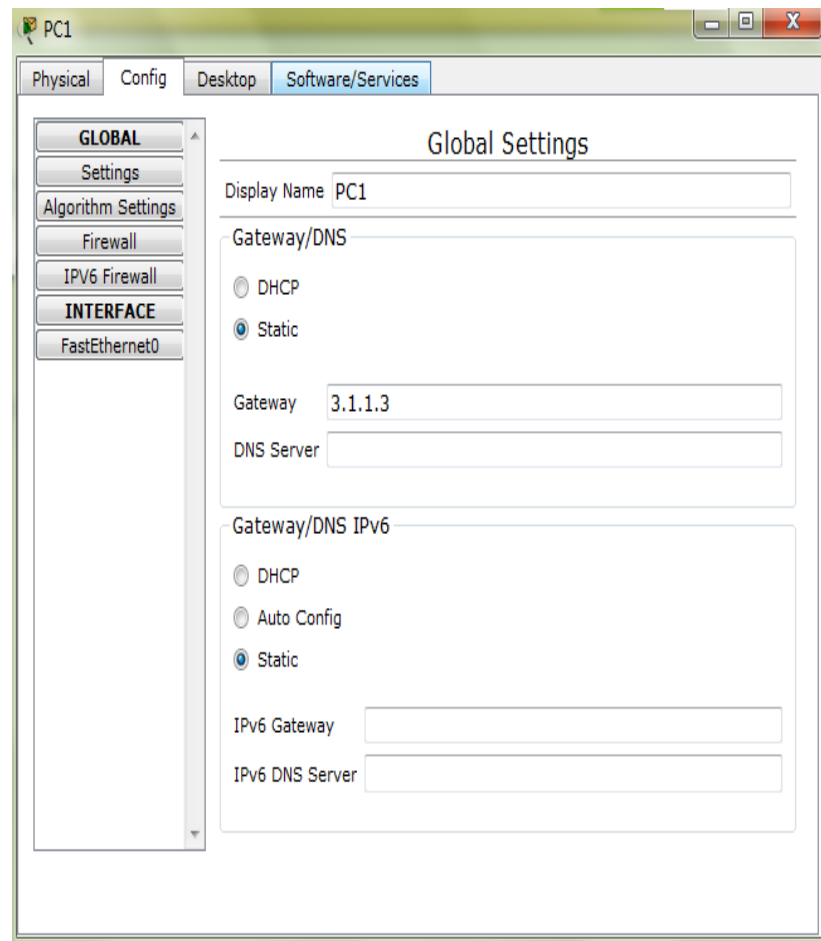
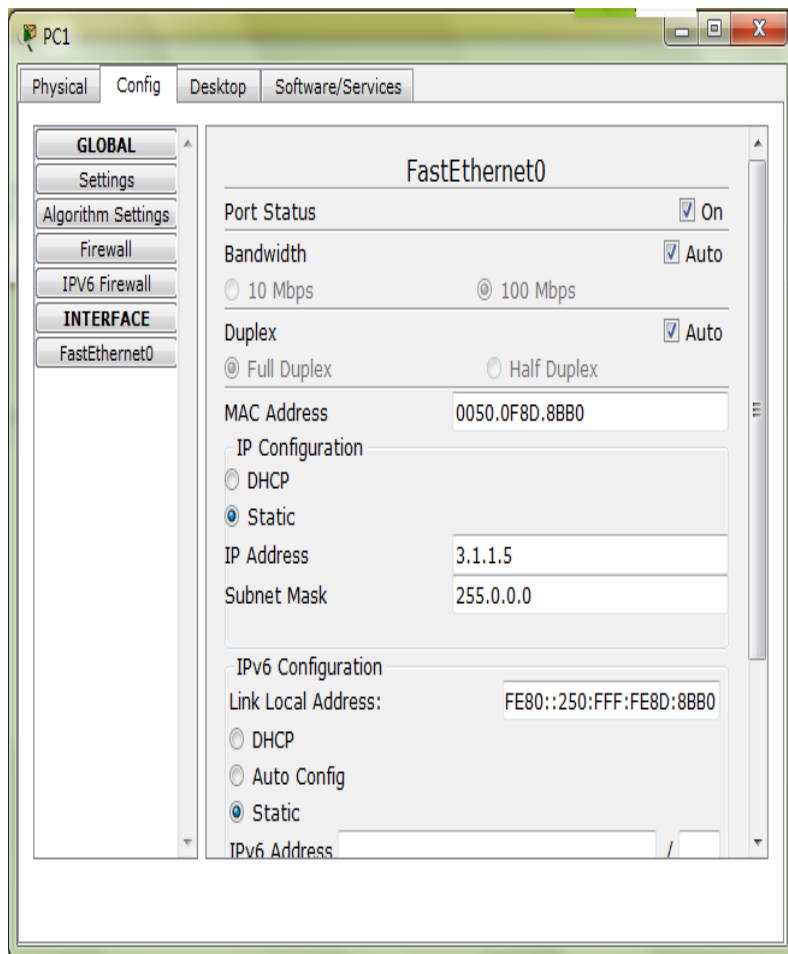
# RIP协议路由器配置实例

## PC1配置过程:

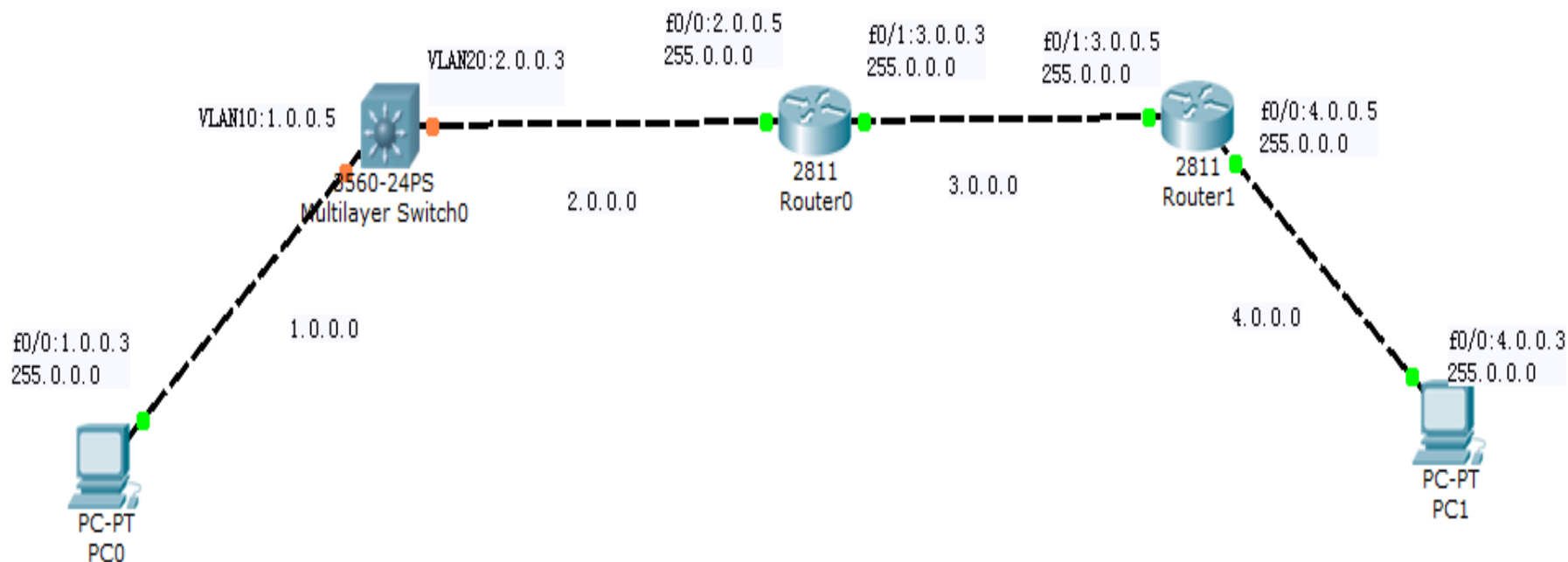


# RIP协议路由器配置实例

## PC2配置过程:



# RIP协议路由器配置实例-2



# RIP协议路由器配置实例-2

## Switch3560的配置

```
Switch#configure terminal
```

```
Switch(config)#interface VLAN 10
```

```
Switch(config-if)#ip address 1.0.0.5 255.0.0.0
```

```
Switch(config-if)#no shutdown
```

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

```
Switch(config)#interface VLAN 20
```

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

```
%LINK-5-CHANGED: Interface Vlan20, changed state to up
```

```
Switch(config-if)#IP ADDRESS 2.0.0.3 255.0.0.0
```

```
Switch(config-if)#no shutdown
```

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

```
Switch(config)#interface F0/1
```

# RIP协议路由器配置实例-2

## Switch3560的配置

**Switch(config-if)#Switchport ACCEss vlan 10**

**Switch(config-if)#no shutdown**

**Switch(config-if)#exit**

**Switch(config)#interface f0/1**

**Switch(config-if)#switchport access VLAN 20**

**Switch(config-if)#**

**%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan20, changed state to up**

**Switch(config-if)#EXIT**

**Switch(config)#ROUTER RIP**

**Switch(config-router)#network 1.0.0.0**

**Switch(config-router)#network 2.0.0.0**

**Switch(config-router)#version 2**

**Switch(config-router)#end**

# RIP协议路由器配置实例-2

## Router0的配置

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

R 1.0.0.0/8 [120/1] via 2.0.0.3, 00:00:01, FastEthernet0/0

C 2.0.0.0/8 is directly connected, FastEthernet0/0

C 3.0.0.0/8 is directly connected, FastEthernet0/1

R 4.0.0.0/8 [120/1] via 3.0.0.5, 00:00:06, FastEthernet0/1

# RIP协议路由器配置实例-2

## Router1的配置

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

R 1.0.0.0/8 [120/2] via 3.0.0.3, 00:00:11, FastEthernet0/1

R 2.0.0.0/8 [120/1] via 3.0.0.3, 00:00:11, FastEthernet0/1

C 3.0.0.0/8 is directly connected, FastEthernet0/1

C 4.0.0.0/8 is directly connected, FastEthernet0/0



# 动态路由协议——OSPF协议

- OSPF协议，即“开放最短路径优先”协议，适用于所有的路由器和三层交换机。
- OSPF协议原理：
  - 1) 区域内每台路由器根据自身的网络连接情况生成自己的链路状况，并告知主路由器；
  - 2) 主路由器将所有路由器的链路状态信息组成链路状态数据库，发布给区域内部各个路由器；
  - 3) 每个路由器根据该数据库信息，利用最短路径算法，计算出以自己为根的最短路径，形成路由表。
- OSPF协议支持各种规模网络，反应速度快，能够减少网络带宽，减少对其它设备的干扰。

# OSPF协议的配置

- OSPF协议配置语法:

Router(config)#router ospf process\_id

—— 进入OSPF协议配置模式, process\_id为ospf进程号

例: Router(config)#router ospf 1

Router(config-router)#network address wildcard area area\_id

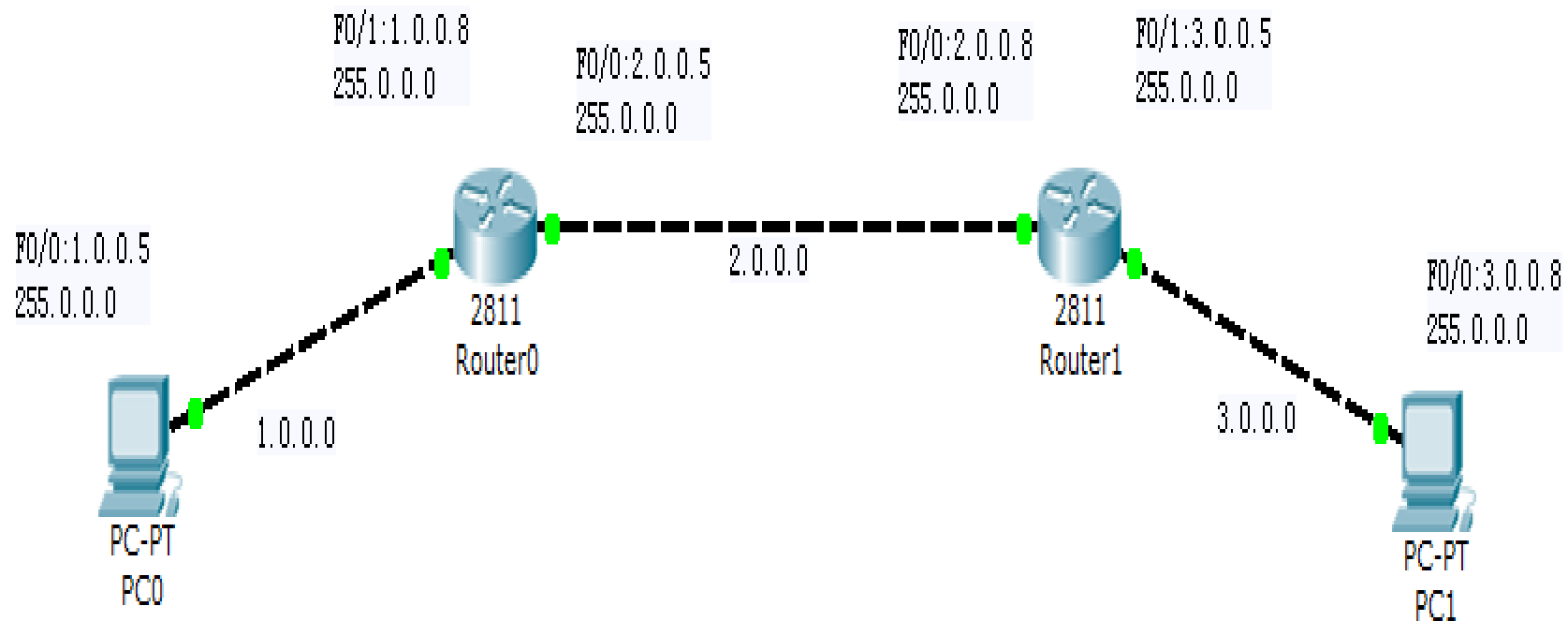
address wildcard:表示运行OSPF端口所在网段地址及相应的子网掩码反码

例: Router(config-router)#network 1.0.0.0 0.255.255.255 area 0

- OSPF协议删除语法

Router(config)# no router ospf process\_id

# OSPF协议的配置



# OSPF协议的配置

## Router0配置过程:

- Router0(config)#ip routing ——— 启用IP路由协议
- Router0(config)#router ospf 1  
协议 ——— 启用进程处理号为1的OSPF
- Router0(config-router)#network 1.0.0.0 0.255.255.255 area 0
- Router0(config-router)#network 2.0.0.0 0.255.255.255 area 0  
———— 在区域0上发布直连网段
- Router0(config-router)#end

# OSPF协议的配置

- Router0#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 1.0.0.0/8 is directly connected, FastEthernet0/1
- C 2.0.0.0/8 is directly connected, FastEthernet0/0
- O 3.0.0.0/8 [110/2] via 2.0.0.8, 00:00:40, FastEthernet0/0

# OSPF协议的配置

## Router1 配置过程:

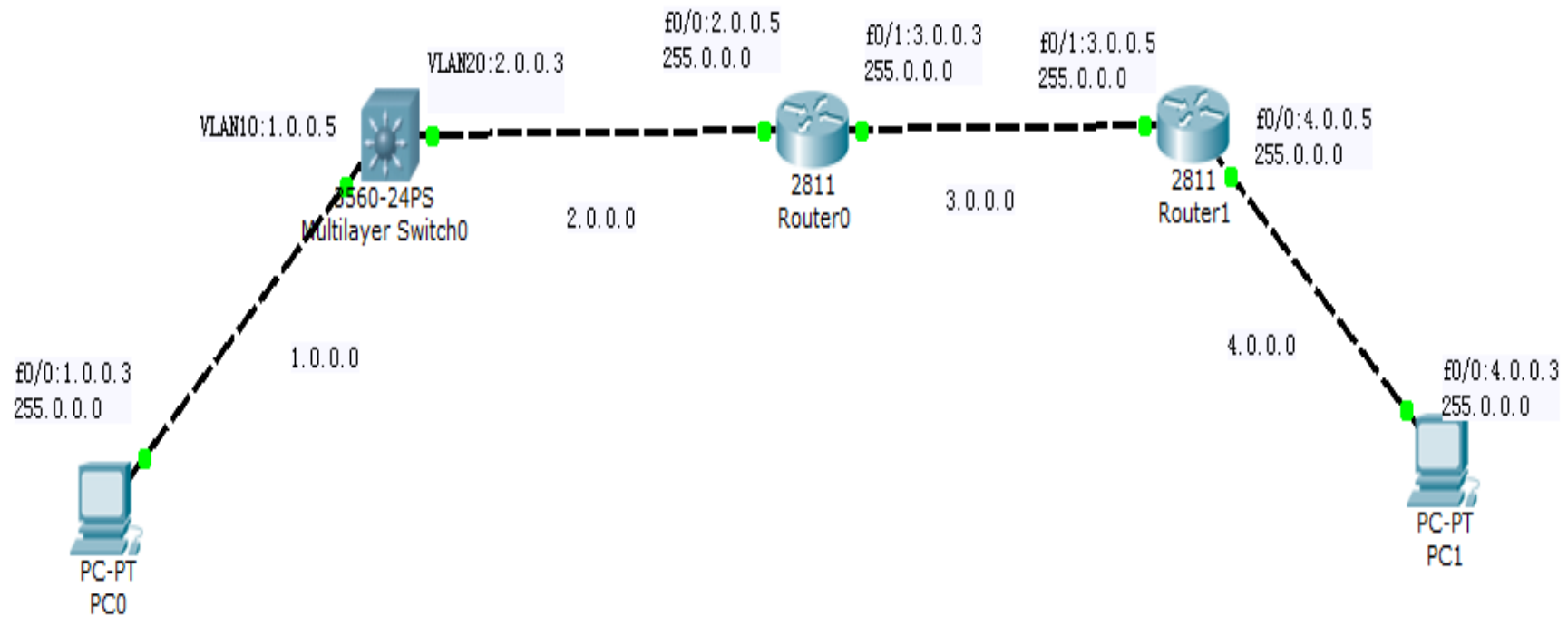
- Router1(config)#ip routing ——— 启用IP路由协议
- Router1(config)#router ospf 1  
OSPF协议 ——— 启用进程处理号为1的
- Router1(config-router)#network 2.0.0.0 0.255.255.255 area 0
- Router1(config-router)#network 3.0.0.0 0.255.255.255 area 0  
———— 在区域0上发布直连网段
- Router1(config-router)#end

# OSPF协议的配置

- Router1#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
- 
- O 1.0.0.0/8 [110/2] via 2.0.0.5, 00:02:27, FastEthernet0/0
  - C 2.0.0.0/8 is directly connected, FastEthernet0/0
  - C 3.0.0.0/8 is directly connected, FastEthernet0/1

注意：OSPF协议必须将网络内各路由器的OSPF都配置完成才可以查看出结果

# OSPF协议的配置-2





# OSPF协议路由器配置实例-2

## Switch3560的配置

```
Switch#configure terminal
```

```
Switch(config)#interface VLAN 10
```

```
Switch(config-if)#ip address 1.0.0.5 255.0.0.0
```

```
Switch(config-if)#no shutdown
```

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

```
Switch(config)#interface VLAN 20
```

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

```
%LINK-5-CHANGED: Interface Vlan20, changed state to up
```

```
Switch(config-if)#ip address 2.0.0.3 255.0.0.0
```

```
Switch(config-if)#no shutdown
```

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

```
Switch(config)#interface F0/1
```

# OSPF协议的配置实例-2

## Switch3560的配置

**Switch(config-if)#switchport access vlan 10**

**Switch(config-if)#no shutdown**

**Switch(config-if)#exit**

**Switch(config)#interface f0/1**

**Switch(config-if)#switchport access VLAN 20**

**Switch(config-if)#**

**%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan20, changed state to up**

**Switch(config-if)#EXIT**

**Switch(config)#router ospf 1**

**Switch(config-router)#network 1.0.0.0 0.255.255.255 area 0**

**Switch(config-router)#network 2.0.0.0 0.255.255.255 area 0**

**Switch(config-router)#end**

# OSPF协议的配置实例-2

- 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
- 
- C 1.0.0.0/8 is directly connected, Vlan10
  - C 2.0.0.0/8 is directly connected, Vlan20
  - O 3.0.0.0/8 [110/2] via 2.0.0.5, 00:10:52, Vlan20
  - O 4.0.0.0/8 [110/3] via 2.0.0.5, 00:10:52, Vlan20

# OSPF协议的配置实例-2

Router0配置过程:

- Router0(config)#ip routing ———启用IP路由协议
- Router0(config)#router ospf 1  
协议 ———启用进程处理号为1的OSPF
- Router0(config-router)#network 1.0.0.0 0.255.255.255 area 0
- Router0(config-router)#network 2.0.0.0 0.255.255.255 area 0  
———在区域0上发布直连网段
- Router0(config-router)#end

# OSPF协议的配置实例-2

Router0#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

- O 1.0.0.0/8 [110/2] via 2.0.0.3, 00:12:34, FastEthernet0/0
- C 2.0.0.0/8 is directly connected, FastEthernet0/0
- C 3.0.0.0/8 is directly connected, FastEthernet0/1
- O 4.0.0.0/8 [110/2] via 3.0.0.5, 00:12:34, FastEthernet0/1

# OSPF协议的配置实例-2

Router1 配置过程:

- Router1(config)#ip routing ——— 启用IP路由协议
- Router1(config)#router ospf 1 ——— 启用进程处理号为1的OSPF协议
- Router1(config-router)#network 3.0.0.0 0.255.255.255 area 0
- Router1(config-router)#network 4.0.0.0 0.255.255.255 area 0  
——— 在区域0上发布直连网段
- Router1(config-router)#end

# OSPF协议的配置实例-2

Router1#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

- O 1.0.0.0/8 [110/3] via 3.0.0.3, 00:13:30, FastEthernet0/1
- O 2.0.0.0/8 [110/2] via 3.0.0.3, 00:13:30, FastEthernet0/1
- C 3.0.0.0/8 is directly connected, FastEthernet0/1
- C 4.0.0.0/8 is directly connected, FastEthernet0/0

# 作业内容与要求

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- 1.理解并熟练掌握路由器的IOS操作命令;
- 2.使用Cisco Paket Tracer平台, 自行设计网络拓扑结构图。网络内至少包含两台路由器设备及若干台终端;
- 3.注明各网段地址和各端口地址;
- 4.配置各终端的网卡地址和网关, 并给出图示;
- 5.使用RIP/OSPF路由协议配置, 使全网互通, 并给出主要配置过程;
- 6.给出全网联通测试图示。





谢谢！