

实验十一、单区域 OSPF 基本配置

一、实验目的

1. 掌握单区域 OSPF 的配置
2. 理解链路状态路由协议的工作过程
3. 掌握实验环境中虚拟接口的配置

二、应用环境

1. 在大规模网络中，OSPF 作为链路状态路由协议的代表应用非常广泛
2. 具有无自环，收敛快的特点

三、实验设备

1. DCR-1751 两台
2. CR-V35MT 一条
3. CR-V35FC 一条

四、实验拓扑



五、实验要求

ROUTER-A

S1/1 192.168.1.1/24
Loopback0 10.10.10.1/24

ROUTER-B

S1/0 192.168.1.2/24
Loopback0 10.10.11.1/24

六、实验步骤

第一步：路由器环回接口的配置（其他接口配置请参见实验三）

路由器 A:

```
Router-A_config#interface loopback0
```

```
Router-A_config_10#ip address 10.10.10.1 255.255.255.0
```

路由器 B:

```
Router-B#config
```

```
Router-B_config#interface loopback0
```

```
Router-B_config_10#ip address 10.10.11.1 255.255.255.0
```

第二步: 验证接口配置

```
Router-B#sh interface loopback0
```

Loopback0 is up, line protocol is up

Hardware is Loopback

Interface address is 10.10.11.1/24

MTU 1514 bytes, BW 8000000 kbit, DLY 500 usec

Encapsulation LOOPBACK

第三步: 路由器的 OSPF 配置

A 的配置:

```
Router-A_config#router ospf 2 ! 启动 OSPF 进程, 进程号为 2
```

```
Router-A_config_ospf_1#network 10.10.10.0 255.255.255.0 area 0 ! 注意要写掩码和区域号
```

```
Router-A_config_ospf_1#network 192.168.1.0 255.255.255.0 area 0
```

B 的配置:

```
Router-B_config#router ospf 1
```

```
Router-B_config_ospf_1#network 10.10.11.0 255.255.255.0 area 0
```

```
Router-B_config_ospf_1#network 192.168.1.0 255.255.255.0 area 0
```

第四步: 查看路由表

路由器 A:

```
Router-A#sh ip route
```

Codes: C - connected, S - static, R - RIP, B - BGP, BC - BGP connected

D - DEIGRP, DEX - external DEIGRP, O - OSPF, OIA - OSPF inter area

ON1 - OSPF NSSA external type 1, ON2 - OSPF NSSA external type 2

OE1 - OSPF external type 1, OE2 - OSPF external type 2

DHCP - DHCP type

VRF ID: 0

C	10.10.10.0/24	is directly connected, Loopback0
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O	10.10.11.1/32	[110,1600] via 192.168.1.2(on Serial1/1)
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! 注意到环回接口产生的是主机路由

C	192.168.1.0/24	is directly connected, Serial1/1
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路由器 B:

```
Router-B#show ip route
```

Codes: C - connected, S - static, R - RIP, B - BGP, BC - BGP connected
D - DEIGRP, DEX - external DEIGRP, O - OSPF, OIA - OSPF inter area
ON1 - OSPF NSSA external type 1, ON2 - OSPF NSSA external type 2
OE1 - OSPF external type 1, OE2 - OSPF external type 2
DHCP - DHCP type

VRF ID: 0

O	10.10.10.1/32	[110,1601] via 192.168.1.1(on Serial1/0) ! 注意管理距离为 110
C	10.10.11.0/24	is directly connected, Loopback0
C	192.168.1.0/24	is directly connected, Serial1/0

第五步: 其他验证命令

Router-B#**sh ip ospf 1** ! 显示该 OSPF 进程的信息

OSPF process: 1, Router ID: 192.168.2.1
Distance: intra-area 110, inter-area 110, external 150
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
SPFTV:11(1), TOs:24, SCHDs:27
All Rtrs support Demand-Circuit.
Number of areas is 1
AREA: 0
Number of interface in this area is 2(UP: 3)
Area authentication type: None
All Rtrs in this area support Demand-Circuit.

Router-A#**show ip ospf interface** ! 显示 OSPF 接口状态和类型

Serial1/1 is up, line protocol is up
Internet Address: 192.168.1.1/24
Nettype: Point-to-Point
OSPF process is 2, AREA: 0, Router ID: 192.168.1.1
Cost: 1600, Transmit Delay is 1 sec, Priority 1
Hello interval is 10, Dead timer is 40, Retransmit is 5
OSPF INTF State is IPOINT_TO_POINT
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 192.168.1.2

Loopback0 is up, line protocol is up
Internet Address: 10.10.10.1/24
Nettype: Broadcast ! 环回接口的网络类型默认为广播
OSPF process is 2, AREA: 0, Router ID: 192.168.1.1
Cost: 1, Transmit Delay is 1 sec, Priority 1
Hello interval is 10, Dead timer is 40, Retransmit is 5
OSPF INTF State is ILOOPBACK
Neighbor Count is 0, Adjacent neighbor count is 0

Router-A#sh ip ospf neighbor

! 显示 OSPF 邻居

OSPF process: 2

AREA: 0

Neighbor ID	Pri	State	DeadTime	Neighbor Addr	Interface
192.168.2.1	1	FULL/-	31	192.168.1.2	Serial1/1

第六步: 修改环回接口的网络类型

Router-A#conf

Router-A_config#interface loopback 0

Router-A_config_10#ip ospf network point-to-point ! 将类型改为点到点

第七步: 查看接口状态和路由器 B 的路由表

Router-A#sh ip ospf interface

Serial1/1 is up, line protocol is up

Internet Address: 192.168.1.1/24

Nettype: Point-to-Point

OSPF process is 2, AREA: 0, Router ID: 192.168.1.1

Cost: 1600, Transmit Delay is 1 sec, Priority 1

Hello interval is 10, Dead timer is 40, Retransmit is 5

OSPF INTF State is IPOINT_TO_POINT

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 192.168.1.2

Loopback0 is up, line protocol is up

Internet Address: 10.10.10.1/24

Nettype: Point-to-Point

OSPF process is 2, AREA: 0, Router ID: 192.168.1.1

Cost: 1, Transmit Delay is 1 sec, Priority 1

Hello interval is 10, Dead timer is 40, Retransmit is 5

OSPF INTF State is IPOINT_TO_POINT

Neighbor Count is 0, Adjacent neighbor count is 0

Router-B#sh ip route

Codes: C - connected, S - static, R - RIP, B - BGP, BC - BGP connected

D - DEIGRP, DEX - external DEIGRP, O - OSPF, OIA - OSPF inter area

ON1 - OSPF NSSA external type 1, ON2 - OSPF NSSA external type 2

OE1 - OSPF external type 1, OE2 - OSPF external type 2

DHCP - DHCP type

VRF ID: 0

O	10.10.10.0/24	[110,1600] via 192.168.1.1(on Serial1/0)
C	10.10.11.0/24	is directly connected, Loopback0
C	192.168.1.0/24	is directly connected, Serial1/0

七、 注意事项和排错

1. 每个路由器的 OSPF 进程号可以不同，一个路由器可以有多个 OSPF 进程
2. OSPF 是无类路由协议，一定要加掩码
3. 第一个区域必须是区域 0

八、 配置序列

Router-A#show running-conf

Building configuration...

Current configuration:

```
!  
!version 1.3.2E  
service timestamps log date  
service timestamps debug date  
no service password-encryption  
!  
hostname Router-A  
!  
!  
interface Loopback0  
 ip address 10.10.10.1 255.255.255.0  
 no ip directed-broadcast  
 ip ospf network point-to-point  
!  
interface FastEthernet0/0  
 ip address 192.168.0.1 255.255.255.0  
 no ip directed-broadcast  
 shutdown  
!  
interface Serial1/0  
 no ip address  
 no ip directed-broadcast  
 physical-layer speed 64000  
!  
interface Serial1/1  
 ip address 192.168.1.1 255.255.255.0  
 no ip directed-broadcast  
 physical-layer speed 64000
```

```
!  
interface Async0/0  
    no ip address  
    no ip directed-broadcast  
!  
!  
router ospf 2  
    network 192.168.1.0 255.255.255.0 area 0  
    network 10.10.10.0 255.255.255.0 area 0  
!  
!
```

九、 共同思考

1. OSPF 与 RIP 有哪些区别？
2. 环回接口有什么好处？

十、 课后练习

请将地址改为 10.0.0.0/24 重复以上实验

十一、 相关命令详解

router ospf

配置路由器使用 OSPF 路由。No router ospf 禁止路由器使用 ospf.

router ospf *process-id*

no router ospf *process-id*

参数

参数	参数说明
<i>process-id</i>	用于内部标示OSPF路由处理的参数，它是本地分配的非负整数。它唯一表示一个ospf的路由处理过程。

缺省

无 OSPF 路由处理被定义。

命令模式

全局配置态

使用说明

在一个路由器中，可以有多个 OSPF 路由处理过程。

示例

下面配置了一个 OSPF 路由处理，其处理号为 109。

```
router ospf 109
```

