网络管理与设计课程实验报告

实验 2：动态路由

姓名	郭一航	院系	计算学部	学号	2021112342
任课教师	余翔湛		指导教师	余翔湛	
实验地点	正心楼 704		实验时间	2023 年 10 月 19 日	
实验课表现	出勤、表现得分 10%		实验报告得分 40%		实验总分	
	操作结果得分 50%					

实验目的：

1. 掌握动态路由配置，掌握通过路由协议管理网络知识
2. 了解RIP、OSPF、BGP路由协议的使用

实验内容：

1. **在路由器 R1、交换机 A、交换机 B 上配置 RIP 协议**
2. **在路由器 R2、交换机 C、交换机 D 上配置 OSPF 协议**
3. **R1 和 R2 路由器间的 BGP 动态路由配置，最后实现子网 1、子网 2、子网 3、子网 4 之间能够互相通信**

1、 列出 R1、R2 中，启动路由协议前和启动路由协议后，通过 sh ip route 分别看到的信息。 得分：

R1启动路由协议之前：

IOS Command Line Interface

```
r1(config-router)#exit
r1(config)#sh ip route
          ^
% Invalid input detected at '^' marker.

r1(config)#exit
r1#
%SYS-5-CONFIG_I: Configured from console by console

r1#sh 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

     192.168.10.0/30 is subnetted, 2 subnets
C       192.168.10.0 is directly connected, FastEthernet0/0
C       192.168.10.4 is directly connected, FastEthernet1/0
r1#
```

R1启动路由协议之后：

```
r1#en
r1#sh 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    192.168.1.0/24 [120/1] via 192.168.10.1, 00:00:06, FastEthernet0/0
R    192.168.2.0/24 [120/1] via 192.168.10.5, 00:00:10, FastEthernet1/0
B    192.168.3.0/24 [20/0] via 192.168.10.10, 00:16:53
B    192.168.4.0/24 [20/0] via 192.168.10.10, 00:16:53
     192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.0 is directly connected, FastEthernet0/0
C       192.168.10.4 is directly connected, FastEthernet1/0
C       192.168.10.8 is directly connected, FastEthernet4/0
r1#
```

R2启动路由协议之前：

```
r2#sh 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

     192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.8 is directly connected, FastEthernet4/0
C       192.168.10.12 is directly connected, FastEthernet0/0
C       192.168.10.16 is directly connected, FastEthernet1/0
r2#
```

R2启动路由协议之后：

```
r2#sh 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

B    192.168.1.0/24 [20/0] via 192.168.10.9, 00:22:26
B    192.168.2.0/24 [20/0] via 192.168.10.9, 00:22:26
O    192.168.3.0/24 [110/2] via 192.168.10.13, 00:21:31, FastEthernet0/0
O    192.168.4.0/24 [110/2] via 192.168.10.17, 00:21:41, FastEthernet1/0
     192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.8 is directly connected, FastEthernet4/0
C       192.168.10.12 is directly connected, FastEthernet0/0
C       192.168.10.16 is directly connected, FastEthernet1/0
r2#
```

2、 列出 A、B，启动了 RIP 协议后，通过 sh ip route 分别看到的信息；	得分：

启动 RIP 协议后，A：

```
A>en
A#sh 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 192.168.10.2 to network 0.0.0.0

C    192.168.1.0/24 is directly connected, Vlan2
R    192.168.2.0/24 [120/2] via 192.168.10.2, 00:00:06, Vlan3
     192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.0 is directly connected, Vlan3
R       192.168.10.4 [120/1] via 192.168.10.2, 00:00:06, Vlan3
R       192.168.10.8 [120/1] via 192.168.10.2, 00:00:06, Vlan3
S*   0.0.0.0/0 [1/0] via 192.168.10.2
A#
```

B：

```
B>en
B#sh 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 192.168.10.6 to network 0.0.0.0

R    192.168.1.0/24 [120/2] via 192.168.10.6, 00:00:03, Vlan3
C    192.168.2.0/24 is directly connected, Vlan2
     192.168.10.0/30 is subnetted, 3 subnets
R       192.168.10.0 [120/1] via 192.168.10.6, 00:00:03, Vlan3
C       192.168.10.4 is directly connected, Vlan3
R       192.168.10.8 [120/1] via 192.168.10.6, 00:00:03, Vlan3
S*   0.0.0.0/0 [1/0] via 192.168.10.6
B#
```

3、 列出 C、D，启动了 OSPF 协议后，没有在 R2 上启动 redistribute bgp 2 前，通过 sh ip route 分别看到的信息；	得分：

C：

```
C#sh 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    192.168.3.0/24 is directly connected, Vlan2
O    192.168.4.0/24 [110/3] via 192.168.10.14, 00:01:53, Vlan1
     192.168.10.0/30 is subnetted, 3 subnets
O       192.168.10.8 [110/2] via 192.168.10.14, 00:05:48, Vlan1
C       192.168.10.12 is directly connected, Vlan1
O       192.168.10.16 [110/2] via 192.168.10.14, 00:05:48, Vlan1
C#
```

D：

```
D#sh 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    192.168.3.0/24 [110/3] via 192.168.10.18, 00:03:03, Vlan1
C    192.168.4.0/24 is directly connected, Vlan2
     192.168.10.0/30 is subnetted, 3 subnets
O       192.168.10.8 [110/2] via 192.168.10.18, 00:03:03, Vlan1
O       192.168.10.12 [110/2] via 192.168.10.18, 00:03:03, Vlan1
C       192.168.10.16 is directly connected, Vlan1
D#
```

4、 列出 C、D，启动了 OSPF 协议后，在 R2 上启动了 redistribute bgp 2 后，通过 sh ip route 分别看到的信息；

得分：

C：

```
C#sh 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 E2 192.168.1.0/24 [110/20] via 192.168.10.14, 00:01:11, Vlan3
O E2 192.168.2.0/24 [110/20] via 192.168.10.14, 00:01:11, Vlan3
C    192.168.3.0/24 is directly connected, Vlan2
O    192.168.4.0/24 [110/3] via 192.168.10.14, 00:01:11, Vlan3
     192.168.10.0/30 is subnetted, 3 subnets
O       192.168.10.8 [110/2] via 192.168.10.14, 00:01:11, Vlan3
C       192.168.10.12 is directly connected, Vlan3
O       192.168.10.16 [110/2] via 192.168.10.14, 00:01:11, Vlan3
C#
```

D：

```
D#sh 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 E2 192.168.1.0/24 [110/20] via 192.168.10.18, 00:02:04, Vlan3
O E2 192.168.2.0/24 [110/20] via 192.168.10.18, 00:02:04, Vlan3
O    192.168.3.0/24 [110/3] via 192.168.10.18, 00:01:54, Vlan3
C    192.168.4.0/24 is directly connected, Vlan2
     192.168.10.0/30 is subnetted, 3 subnets
O       192.168.10.8 [110/2] via 192.168.10.18, 00:02:04, Vlan3
O       192.168.10.12 [110/2] via 192.168.10.18, 00:01:54, Vlan3
C       192.168.10.16 is directly connected, Vlan3
D#
```

5、 根据你的理解，简单阐述内部网关协议和外部网关协议的关系。	得分：
内部网关协议和外部网关协议都是用于路由信息交换的协议，内部网关协议主要用于同一组织或者一个自治系统的路由信息的交换，设计通常比较简单，因为他们只需要处理局部网络的路由问题，可能没有复杂的策略和路由选择机制的能力；外部网关协议主要用于不同自治系统之间的路由信息交换，目的是连接不同的组织或网络服务提供商，当今的互联网主要依赖外部网关协议来进行路由决策，通常能进行复杂的路由策略设置和路径选择，以满足各种商业和技术的要求。在大多数的现代网络中，这两种协议通常会一起使用。	
指导教师评语：	
日期：	