OSPF综合实验（gns模拟器）

**我只是个实验的搬运工，如有问题请咨询涛哥！！——JK**

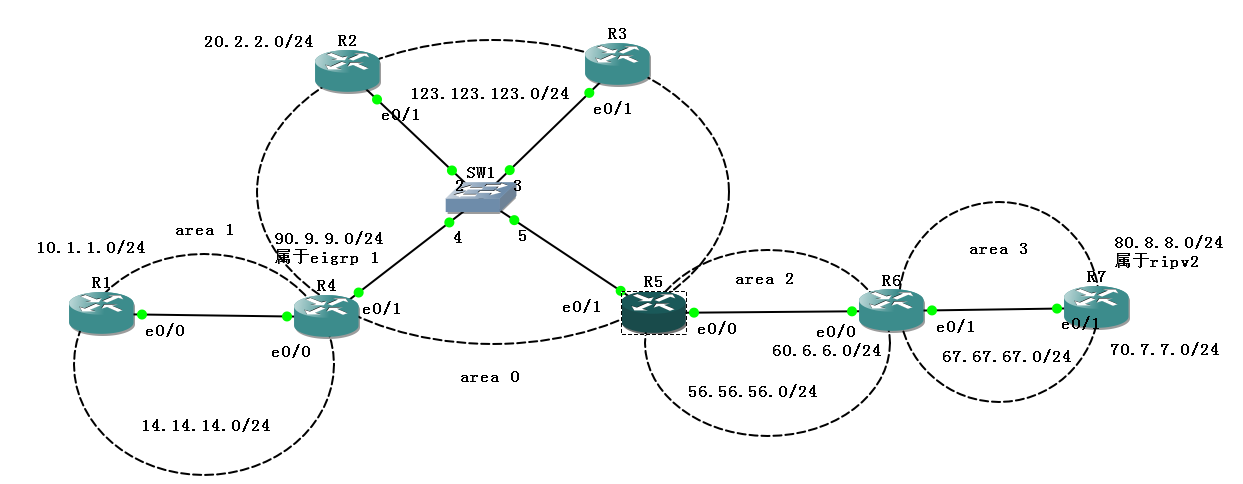
注意点：

1.Ospf实验推荐用gns制作

2.最后一个T-stub，T-nssa实验推荐重做一个新的拓扑，太懒就没有做啦！(推荐图在最后！)

//图中的交换机可以视觉忽略或缩小成一个点。（^ v ^）

Ospf实验拓扑图



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1.Ospf 基础配置

R1：

R1#conf t

R1(config)#int e0/0

R1(config-if)#ip add 14.14.14.1 255.255.255.0

R1(config-if)#no shut

R1(config-if)#int lo0

R1(config-if)#ip add 10.1.1.1 255.255.255.0

R1(config-if)#end

R1#conf t

R1(config)#router ospf 1

R1(config-router)#router-id 1.1.1.1

R1(config-router)#net 10.1.1.0 0.0.0.255 a 1

R1(config-router)#net 14.14.14.0 0.0.0.255 a 1

R2：

R2#conf t

R2(config)#int e0/1

R2(config-if)#ip add 123.123.123.2 255.255.255.0

R2(config-if)#no shut

R2(config-if)#int lo0

R2(config-if)#ip add 20.2.2.2 255.255.255.0

R2(config-if)#no shut

R2(config-if)#end

R2#conf t

R2(config)#router ospf 1

R2(config-router)#router-id 2.2.2.2

R2(config-router)#net 123.123.123.2 0.0.0.0 a 0

R2(config-router)#net 20.2.2.2 0.0.0.0 a 0

R2(config-router)#end

R3：

R3#conf t

R3(config)#int e0/1

R3(config-if)#ip add 123.123.123.3 255.255.255.0

R3(config-if)#no shut

R3(config-if)#exit

R3(config)#router ospf 1

R3(config-router)#router-id 3.3.3.3

R3(config-router)#net 123.123.123.3 0.0.0.0 a 0

R3(config-router)#end

R4：

R4#conf t

R4(config)#int e0/0

R4(config-if)#ip add 14.14.14.4 255.255.255.0

R4(config-if)#no shut

R4(config-if)#int e0/1

R4(config-if)#ip add 123.123.123.4 255.255.255.0

R4(config-if)#no shut

R4(config)#int lo0

R4(config-if)#ip add 90.9.9.9 255.255.255.0

R4(config-if)#end

R4#conf t

R4(config)#router ospf 1

R4(config-router)#router

R4(config-router)#router-id 4.4.4.4

R4(config-router)#net 14.14.14.0 0.0.0.255 a 1

R4(config-router)#net 123.123.123.4 0.0.0.0 a 0

R4(config-router)#end

R5：

R5#conf t

R5(config)#int e0/0

R5(config-if)#ip add 56.56.56.5 255.255.255.0

R5(config-if)#no shut

R5(config-if)#int e0/1

R5(config-if)#ip add 123.123.123.5 255.255.255.0

R5(config-if)#no shut

R5(config-if)#end

R5#conf t

R5(config)#router ospf 1

R5(config-router)#router-id 5.5.5.5

R5(config-router)#net 123.123.123.5 0.0.0.0 a 0

R5(config-router)#net 56.56.56.0 0.0.0.255 a 2

R5(config-router)#end

R6：

R6#conf t

R6(config)#int e0/0

R6(config-if)#ip add 56.56.56.6 255.255.255.0

R6(config-if)#no shut

R6(config-if)#int e0/1

R6(config-if)#ip add 67.67.67.6 255.255.255.0

R6(config-if)#no shut

R6(config-if)#int lo0

R6(config-if)#ip add 60.6.6.6 255.255.255.0

R6(config-if)#end

R6#conf t

R6(config)#router ospf 1

R6(config-router)#router-id 6.6.6.6

R6(config-router)#net 60.6.6.0 0.0.0.255 a 2

R6(config-router)#net 56.56.56.0 0.0.0.255 a 2

R6(config-router)#net 67.67.67.0 0.0.0.255 a 3

R6(config-router)#end

R7：

R7#conf t

R7(config)#int e0/1

R7(config-if)#ip add 67.67.67.7 255.255.255.0

R7(config-if)#no shut

R7(config-if)#int lo 0

R7(config-if)#ip add 70.7.7.7 255.255.255.0

R1(config-if)#int lo 1

R1(config-if)#ip add 80.8.8.8 255.255.255.0

R7(config-if)#end

R7#conf t

R7(config)#router ospf 1

R7(config-router)#router-id 7.7.7.7

R7(config-router)#net 70.7.7.0 0.0.0.255 a 3

R7(config-router)#net 67.67.67.0 0.0.0.255 a 3

R7(config-router)#end

检验邻居关系

R4#**show ip ospf neighbor**

Neighbor ID Pri State Dead Time Address Interface

2.2.2.2 1 FULL/DROTHER 00:00:30 123.123.123.2 Ethernet0/1

3.3.3.3 1 FULL/DROTHER 00:00:35 123.123.123.3 Ethernet0/1

5.5.5.5 1 FULL/DR 00:00:34 123.123.123.5 Ethernet0/1

1.1.1.1 1 FULL/BDR 00:00:35 14.14.14.1 Ethernet0/0

R4#show ip route ospf

20.0.0.0/32 is subnetted, 1 subnets

O 20.2.2.2 [110/11] via 123.123.123.2, 00:33:28, Ethernet0/1

10.0.0.0/32 is subnetted, 1 subnets

O 10.1.1.1 [110/11] via 14.14.14.1, 00:33:28, Ethernet0/0

56.0.0.0/24 is subnetted, 1 subnets

O IA 56.56.56.0 [110/20] via 123.123.123.5, 00:33:28, Ethernet0/1

60.0.0.0/32 is subnetted, 1 subnets

O IA 60.6.6.6 [110/21] via 123.123.123.5, 00:33:28, Ethernet0/1

2.环回口改成点到点网络

**由于环回口被视为主机，环回口网络总被当作主机路由学习**

10.0.0.0/32 is subnetted, 1 subnets

O 10.1.1.1 [110/11] via 14.14.14.1, 00:33:28, Ethernet0/0

现在将R1 环回口0 改成点到点网络

R1#show ip ospf interface loopback 0

Loopback0 is up, line protocol is up

Internet Address 10.1.1.1/24, Area 1

Process ID 1, Router ID 1.1.1.1, Network Type LOOPBACK, Cost: 1

Loopback interface is treated as a stub Host

R1：

R1#CONF T

R1(config)#int lo 0

R1(config-if)#ip ospf network point-to-point

检验：

R1#show ip ospf interface loopback 0

Loopback0 is up, line protocol is up

Internet Address 10.1.1.1/24, Area 1

Process ID 1, Router ID 1.1.1.1, Network Type POINT\_TO\_POINT, Cost: 1

Transmit Delay is 1 sec, State POINT\_TO\_POINT,

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

oob-resync timeout 40

Supports Link-local Signaling (LLS)

Index 1/1, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 0, maximum is 0

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 0, Adjacent neighbor count is 0

Suppress hello for 0 neighbor(s)

R4#show ip route ospf

20.0.0.0/32 is subnetted, 1 subnets

O 20.2.2.2 [110/11] via 123.123.123.2, 00:45:58, Ethernet0/1

10.0.0.0/24 is subnetted, 1 subnets

O 10.1.1.0 [110/11] via 14.14.14.1, 00:01:39, Ethernet0/0

56.0.0.0/24 is subnetted, 1 subnets

O IA 56.56.56.0 [110/20] via 123.123.123.5, 00:01:39, Ethernet0/1

60.0.0.0/32 is subnetted, 1 subnets

O IA 60.6.6.6 [110/21] via 123.123.123.5, 00:01:39, Ethernet0/1

3.改优先级

由于ospf配置后，先配置的就变为DR,BDR。因此如果先配置R2，R3则R2，R3是DR,BDR

现在要将R5变成DR,R4变为BDR。那么就是将R2，R3，R4的优先级变为0，放弃DR,BDR竞选，然后再将其R4，R3，R2优先级恢复为1.

R2，R3，R4的优先级变为0，放弃DR,BDR竞选

R2:

R2(config)#INT E0/1

R2(config-if)#IP OSPF PRI

R2(config-if)#IP OSPF PRIority 0

R3:

R3#conf t

R3(config)#int e0/1

R3(config-if)#ip ospf priority 0

R4:

R4#conf t

R4(config)#int e0/1

R4(config-if)#ip ospf priority 0

R4，R3，R2优先级恢复为1.

R4:

R4#conf t

R4(config)#int e0/1

R4(config-if)#ip ospf priority 1

R3:

R3#conf t

R3(config)#int e0/1

R3(config-if)#ip ospf priority 1

R2:

R2#conf t

R2(config)#int e0/1

R2(config-if)#ip ospf priority 1

检验：

R2#show ip ospf nei

Neighbor ID Pri State Dead Time Address Interface

3.3.3.3 1 2WAY/DROTHER 00:00:37 123.123.123.3 Ethernet0/1

4.4.4.4 1 FULL/BDR 00:00:37 123.123.123.4 Ethernet0/1

5.5.5.5 1 FULL/DR 00:00:32 123.123.123.5 Ethernet0/1

4.ospf的手动汇总

4.1)区域间手动汇总（只能在ABR上做）

R4#conf t

R4(config)#router ospf 1 //进入ospf 1

R4(config-router)#area 1 range 10.0.0.0 255.0.0.0

验证：

R5#show ip route ospf

20.0.0.0/32 is subnetted, 1 subnets

O 20.2.2.2 [110/11] via 123.123.123.2, 01:22:01, Ethernet0/1

O IA 10.0.0.0/8 [110/21] via 123.123.123.4, 00:01:19, Ethernet0/1

14.0.0.0/24 is subnetted, 1 subnets

O IA 14.14.14.0 [110/20] via 123.123.123.4, 01:22:01, Ethernet0/1

60.0.0.0/32 is subnetted, 1 subnets

O 60.6.6.6 [110/11] via 56.56.56.6, 01:22:01, Ethernet0/0

R6#show ip route ospf

70.0.0.0/32 is subnetted, 1 subnets

O 70.7.7.7 [110/11] via 67.67.67.7, 01:23:44, Ethernet0/1

20.0.0.0/32 is subnetted, 1 subnets

O IA 20.2.2.2 [110/21] via 56.56.56.5, 01:23:34, Ethernet0/0

O IA 10.0.0.0/8 [110/31] via 56.56.56.5, 00:02:57, Ethernet0/0

123.0.0.0/24 is subnetted, 1 subnets

O IA 123.123.123.0 [110/20] via 56.56.56.5, 01:23:34, Ethernet0/0

14.0.0.0/24 is subnetted, 1 subnets

O IA 14.14.14.0 [110/30] via 56.56.56.5, 01:23:34, Ethernet0/0

5.ospf认证

链路认证：ABR 与 常规

明文：

R1:

R1#conf t

R1(config)#int e0/0

R1(config-if)#ip ospf authentication //启用明文认证

R1(config-if)#ip ospf authentication-key abc123

R4:

R4#conf t

R4(config)#int e0/0

R4(config-if)#ip ospf authentication

R4(config-if)#ip ospf authentication-key abc123

密文：

R6#conf t

R6(config)#int e0/0

R6(config-if)#ip ospf authentication message-digest

R6(config-if)#ip ospf message-digest-key 1 md5 abc

R5#conf t

R5(config)#int e0/0

R5(config-if)#ip ospf authentication message-digest

R5(config-if)#ip ospf message-digest-key 1 md5 abc

区域认证：骨干

密文：

R2#conf t

R2(config)#router ospf 1

R2(config-router)#area 0 authentication message-digest

R2(config-router)#exit

R2(config)#int e0/1

R2(config-if)#ip ospf message-digest-key 2 md5 CHINA

R3#conf t

R3(config)#router ospf 1

R3(config-router)#area 0 authentication message-digest

R3(config-router)#ip ospf message

R3(config-router)#exit

R3(config)#int e0/1

R3(config-if)#ip ospf message-digest-key 2 md5 CHINA

R4#conf t

R4(config)#router ospf 1

R4(config-router)#area 0 authentication message-digest

R4(config-router)#exit

R4(config)#int e0/1

R4(config-if)#ip ospf message-digest-key 2 md5 CHINA

R5#conf t

R5(config)#router ospf 1

R5(config-router)#area 0 authentication message-digest

R5(config-router)#exit

R5(config)#int e0/1

R5(config-if)#ip ospf message-digest-key 2 md5 CHINA

**区域所有设备接口参与，除环回口**

6.ospf发布缺省路由更新

R2#conf t

R2(config)#router ospf 1

R2(config-router)#default-information originate always metric 2

现象：

R5#show ip route ospf

20.0.0.0/32 is subnetted, 1 subnets

O 20.2.2.2 [110/11] via 123.123.123.2, 00:00:33, Ethernet0/1

O IA 10.0.0.0/8 [110/21] via 123.123.123.4, 00:00:33, Ethernet0/1

14.0.0.0/24 is subnetted, 1 subnets

O IA 14.14.14.0 [110/20] via 123.123.123.4, 00:00:33, Ethernet0/1

60.0.0.0/32 is subnetted, 1 subnets

O 60.6.6.6 [110/11] via 56.56.56.6, 00:52:03, Ethernet0/0

O\*E2 0.0.0.0/0 [110/2] via 123.123.123.2, 00:00:33, Ethernet0/1

7.孤岛区域和区域分割

孤岛区域就是没有通过ABR和骨干区域相连的常规区域（图中的area 3）

解决方案：虚电路virtual-link

骨干区域做链路认证，虚电路必须启动认证

R6#conf t

R6(config)#router ospf 1

R6(config-router)#area 2 virtual-link 5.5.5.5 //虚链路配置完成（没有认证的话）

R6(config-router)#AREA 2 virtual-link 5.5.5.5 authentication message-digest

R6(config-router)#area 2 virtual-link 5.5.5.5 message-digest-key 2 md5 CHINA

R6(config-router)#end

R5#conf t

R5(config)#router ospf 1

R5(config-router)#area 2 virtual-link 6.6.6.6

R5(config-router)#AREA 2 virtual-link 6.6.6.6 authentication message-digest

R5(config-router)#area 2 virtual-link 6.6.6.6 message-digest-key 2 md5 CHINA

R5(config-router)#end

测试：

1.R7#ping 10.1.1.1 so 70.7.7.7

2.

R6#show ip ospf neighbor

Neighbor ID Pri State Dead Time Address Interface

5.5.5.5 0 FULL/ - - 56.56.56.5 OSPF\_VL1

5.5.5.5 1 FULL/BDR 00:00:34 56.56.56.5 Ethernet0/0

7.7.7.7 1 FULL/DR 00:00:35 67.67.67.7 Ethernet0/1

3.路由表对比

虚拟链路前：

R2#show ip route

Codes: 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

i - IS-IS, su - IS-IS summary, 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

20.0.0.0/24 is subnetted, 1 subnets

C 20.2.2.0 is directly connected, Loopback0

O IA 10.0.0.0/8 [110/21] via 123.123.123.4, 00:38:57, Ethernet0/1

56.0.0.0/24 is subnetted, 1 subnets

O IA 56.56.56.0 [110/20] via 123.123.123.5, 00:38:57, Ethernet0/1

123.0.0.0/24 is subnetted, 1 subnets

C 123.123.123.0 is directly connected, Ethernet0/1

14.0.0.0/24 is subnetted, 1 subnets

O IA 14.14.14.0 [110/20] via 123.123.123.4, 00:38:57, Ethernet0/1

60.0.0.0/32 is subnetted, 1 subnets

O IA 60.6.6.6 [110/21] via 123.123.123.5, 00:38:59, Ethernet0/1

虚拟链路后：

R2#show ip route

Codes: 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

i - IS-IS, su - IS-IS summary, 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

70.0.0.0/32 is subnetted, 1 subnets

O IA 70.7.7.7 [110/31] via 123.123.123.5, 00:00:02, Ethernet0/1

20.0.0.0/24 is subnetted, 1 subnets

C 20.2.2.0 is directly connected, Loopback0

67.0.0.0/24 is subnetted, 1 subnets

O IA 67.67.67.0 [110/30] via 123.123.123.5, 00:00:02, Ethernet0/1

O IA 10.0.0.0/8 [110/21] via 123.123.123.4, 00:00:02, Ethernet0/1

56.0.0.0/24 is subnetted, 1 subnets

O IA 56.56.56.0 [110/20] via 123.123.123.5, 00:00:02, Ethernet0/1

123.0.0.0/24 is subnetted, 1 subnets

C 123.123.123.0 is directly connected, Ethernet0/1

14.0.0.0/24 is subnetted, 1 subnets

O IA 14.14.14.0 [110/20] via 123.123.123.4, 00:00:04, Ethernet0/1

60.0.0.0/32 is subnetted, 1 subnets

O IA 60.6.6.6 [110/21] via 123.123.123.5, 00:05:40, Ethernet0/1

8.STUB 和 NSSA的配置

8.1）将外部路由嵌套入ospf

R7#conf t

R7(config)#router rip

R7(config-router)#version 2

R7(config-router)#no auto-summary

R7(config-router)#net 80.8.8.0

R7(config-router)#exit

R7(config)#router ospf 1

R7(config-router)#redistribute rip subnets

R7(config-router)#end

R4#conf t

R4(config)#router eigrp 1

R4(config-router)#no auto-summary

R4(config-router)# eigrp router-id 40.4.4.4

R4(config-router)#net 90.9.9.0 0.0.0.255

R4(config-router)#exit

R4(config)#router ospf 1

R4(config-router)#redistribute eigrp 1 subnets

R4(config-router)#end

测试：

R2#show ip rout ospf

70.0.0.0/32 is subnetted, 1 subnets

O IA 70.7.7.7 [110/31] via 123.123.123.5, 00:06:45, Ethernet0/1

80.0.0.0/24 is subnetted, 1 subnets

O E2 80.8.8.0 [110/20] via 123.123.123.5, 00:00:39, Ethernet0/1

67.0.0.0/24 is subnetted, 1 subnets

O IA 67.67.67.0 [110/30] via 123.123.123.5, 00:06:45, Ethernet0/1

O IA 10.0.0.0/8 [110/21] via 123.123.123.4, 00:06:45, Ethernet0/1

56.0.0.0/24 is subnetted, 1 subnets

O IA 56.56.56.0 [110/20] via 123.123.123.5, 00:06:45, Ethernet0/1

14.0.0.0/24 is subnetted, 1 subnets

O IA 14.14.14.0 [110/20] via 123.123.123.4, 00:06:45, Ethernet0/1

90.0.0.0/24 is subnetted, 1 subnets

O E2 90.9.9.0 [110/20] via 123.123.123.4, 00:06:45, Ethernet0/1

60.0.0.0/32 is subnetted, 1 subnets

O IA 60.6.6.6 [110/21] via 123.123.123.5, 00:06:45, Ethernet0/1

8.2）T-STUB：

R4：

R4#conf t

R4(config)#router ospf 1

R4(config-router)#area 1 stub no-summary

R1：

R1#conf t

R1(config)#router ospf 1

R1(config-router)#area 1 stub

检验：

建立前：

R1#show ip rou ospf

70.0.0.0/32 is subnetted, 1 subnets

O IA 70.7.7.7 [110/41] via 14.14.14.4, 00:10:18, Ethernet0/0

80.0.0.0/24 is subnetted, 1 subnets

O E2 80.8.8.0 [110/20] via 14.14.14.4, 00:05:38, Ethernet0/0

20.0.0.0/32 is subnetted, 1 subnets

O IA 20.2.2.2 [110/21] via 14.14.14.4, 00:10:18, Ethernet0/0

67.0.0.0/24 is subnetted, 1 subnets

O IA 67.67.67.0 [110/40] via 14.14.14.4, 00:10:18, Ethernet0/0

56.0.0.0/24 is subnetted, 1 subnets

O IA 56.56.56.0 [110/30] via 14.14.14.4, 00:10:18, Ethernet0/0

123.0.0.0/24 is subnetted, 1 subnets

O IA 123.123.123.0 [110/20] via 14.14.14.4, 00:10:18, Ethernet0/0

90.0.0.0/24 is subnetted, 1 subnets

O E2 90.9.9.0 [110/20] via 14.14.14.4, 00:10:18, Ethernet0/0

60.0.0.0/32 is subnetted, 1 subnets

O IA 60.6.6.6 [110/31] via 14.14.14.4, 00:10:18, Ethernet0/0

O\*E2 0.0.0.0/0 [110/2] via 14.14.14.4, 00:10:18, Ethernet0/0

建立后：

R1#show ip route ospf

O\*IA 0.0.0.0/0 [110/11] via 14.14.14.4, 00:00:34, Ethernet0/0

8.3)T-NSSA

R5#conf t

R5(config)#router ospf 1

R5(config-router)#area 3 nssa no-summary

R7#conf t

R7(config)#router ospf 1

R7(config-router)#area 2 nssa

R7(config-router)#end

推荐T-STUB,T-NSSA拓扑图

