虚链路试验

试验1: 孤岛区域

实验需求：

要求区域1被配置为传输区域，最终实现R1 R4 相互学习路由

实验步骤：

步骤1：基础配置

R1

en

conf t

int lo 0

ip add 10.1.1.1 255.255.255.0

no sh

!

int fa0/0

ip add 12.12.12.1 255.255.255.0

no sh

!

router ospf 1

router-id 1.1.1.1

net 10.1.1.0 0.0.0.255 area 0

net 12.12.12.0 0.0.0.255 area 0

!

end

R2

en

conf t

!

int fa0/0

ip add 12.12.12.2 255.255.255.0

no sh

!

int fa0/1

ip add 23.23.23.2 255.255.255.0

no sh

!

router ospf 1

router-id 2.2.2.2

net 12.12.12.2 0.0.0.0 a 0

net 23.23.23.2 0.0.0.0 a 1

!

end

R3

en

conf t

!

int fa 0/1

ip add 23.23.23.3 255.255.255.0

no sh

!

int fa 0/0

ip add 34.34.34.3 255.255.255.0

no sh

!

router ospf 1

router-id 3.3.3.3

net 23.23.23.3 0.0.0.0 a 1

net 34.34.34.3 0.0.0.0 a 1

!

end

R4

en

conf t

!

int lo 0

ip add 40.1.1.1 255.255.255.0

no sh

!

int fa0/0

ip add 34.34.34.4 255.255.255.0

no sh

!

router ospf 1

router-id 4.4.4.4

net 40.1.1.1 0.0.0.0 a 2

net 34.34.34.4 0.0.0.0 a 2

!

end

此时完成如上配置后，R1 的LOOPBACK 0，R2 可以学习，R3可以学习，但是R4不学习

R4 不学习，因为AREA 2 是孤岛区域，反之亦然，R4 LOOPBACK 0 ，R1 不学

R3#show ip route ospf

10.0.0.0/32 is subnetted, 1 subnets

O IA 10.1.1.1 [110/21] via 23.23.23.2, 00:00:00, FastEthernet0/1

12.0.0.0/24 is subnetted, 1 subnets

O IA 12.12.12.0 [110/20] via 23.23.23.2, 00:00:00, FastEthernet0/1

R3#

如上现象表明R3 学习了10网络

R4#show ip route ospf

R4#

R4 路由表不学习任何区域0及区域1路由，因为孤岛区域。

步骤2：完成R2 R3 上虚链路配置

R2

router ospf 1

area 1 virtual-link 3.3.3.3

R3

router ospf 1

area 1 virtual-link 2.2.2.2

此时一定要注意，控制台会提示我们一个虚链路的邻接关系建立，且R1 R4 互学路由，现象如下：

\*Mar 1 00:13:20.799: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on OSPF\_VL0 from LOADING to FULL, Loading Done

R1#show ip route ospf

34.0.0.0/24 is subnetted, 1 subnets

O IA 34.34.34.0 [110/30] via 12.12.12.2, 00:00:23, FastEthernet0/0

23.0.0.0/24 is subnetted, 1 subnets

O IA 23.23.23.0 [110/20] via 12.12.12.2, 00:04:38, FastEthernet0/0

40.0.0.0/32 is subnetted, 1 subnets

O IA 40.1.1.1 [110/31] via 12.12.12.2, 00:00:23, FastEthernet0/0

R1#

R4#show ip route ospf

23.0.0.0/24 is subnetted, 1 subnets

O IA 23.23.23.0 [110/20] via 34.34.34.3, 00:00:49, FastEthernet0/0

10.0.0.0/32 is subnetted, 1 subnets

O IA 10.1.1.1 [110/31] via 34.34.34.3, 00:00:39, FastEthernet0/0

12.0.0.0/24 is subnetted, 1 subnets

O IA 12.12.12.0 [110/30] via 34.34.34.3, 00:00:39, FastEthernet0/0

R4#

如上现象表明，虚链路，已经帮助我们客服孤岛区域问题。

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实验2：区域分割解析实验

实验需求：利用虚链路将被分割的区域0连接，帮助区域0学习对方路由

步骤1：完成基础的OSPF 配置

R1

en

conf t

int lo 0

ip add 10.1.1.1 255.255.255.0

no sh

!

int fa0/0

ip add 12.12.12.1 255.255.255.0

no sh

!

router ospf 1

router-id 1.1.1.1

net 10.1.1.0 0.0.0.255 area 0

net 12.12.12.0 0.0.0.255 area 0

!

end

R2

en

conf t

!

int fa0/0

ip add 12.12.12.2 255.255.255.0

no sh

!

int fa0/1

ip add 23.23.23.2 255.255.255.0

no sh

!

router ospf 1

router-id 2.2.2.2

net 12.12.12.2 0.0.0.0 a 0

net 23.23.23.2 0.0.0.0 a 1

!

end

R3

en

conf t

!

int fa 0/1

ip add 23.23.23.3 255.255.255.0

no sh

!

int fa 0/0

ip add 34.34.34.3 255.255.255.0

no sh

!

router ospf 1

router-id 3.3.3.3

net 23.23.23.3 0.0.0.0 a 1

net 34.34.34.3 0.0.0.0 a 0

!

end

R4

en

conf t

!

int lo 0

ip add 40.1.1.1 255.255.255.0

no sh

!

int fa0/0

ip add 34.34.34.4 255.255.255.0

no sh

!

router ospf 1

router-id 4.4.4.4

net 40.1.1.1 0.0.0.0 a 0

net 34.34.34.4 0.0.0.0 a 0

!

end

此时，因为区域被分割，所以R1 R4 不该学习对端LOOPBACK 0 路由，用如下方式校验：

R1#show ip route ospf

23.0.0.0/24 is subnetted, 1 subnets

O IA 23.23.23.0 [110/20] via 12.12.12.2, 00:08:49, FastEthernet0/0

R1#

R4#show ip route ospf

23.0.0.0/24 is subnetted, 1 subnets

O IA 23.23.23.0 [110/20] via 34.34.34.3, 00:00:27, FastEthernet0/0

R4#

如上现象表明，区域被分割，路由不学习

步骤2：R2 R3 完成虚链路的配置

R2

router ospf 1

area 1 virtual-link 3.3.3.3

R3

router ospf 1

area 1 virtual-link 2.2.2.2

如上配置完成后，最终R1 R4一定会相互学习路由，现象如下：  
R1#show ip route ospf

34.0.0.0/24 is subnetted, 1 subnets

O 34.34.34.0 [110/30] via 12.12.12.2, 00:00:13, FastEthernet0/0

23.0.0.0/24 is subnetted, 1 subnets

O IA 23.23.23.0 [110/20] via 12.12.12.2, 00:11:08, FastEthernet0/0

40.0.0.0/32 is subnetted, 1 subnets

**O 40.1.1.1 [110/31] via 12.12.12.2, 00:00:13, FastEthernet0/0**

R1#

R4#show ip route ospf

23.0.0.0/24 is subnetted, 1 subnets

O IA 23.23.23.0 [110/20] via 34.34.34.3, 00:03:01, FastEthernet0/0

10.0.0.0/32 is subnetted, 1 subnets

**O 10.1.1.1 [110/31] via 34.34.34.3, 00:00:39, FastEthernet0/0**

12.0.0.0/24 is subnetted, 1 subnets

O 12.12.12.0 [110/30] via 34.34.34.3, 00:00:39, FastEthernet0/0

R4#

如上现象表明实验已经成功，……——……

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实验三：虚链路增强实验

实验需求：

要求区域1完成多条虚链路的配置，并且要求数据流量为如下路径：

源于R6 去向R1的流量要走 R4 R2，当R4 DOWN 了流量走R5 R3

步骤1：完成基础配置

R1

en

conf t

!

int lo 0

ip add 10.1.1.1 255.255.255.0

no sh

!

int fa0/0

ip add 172.16.1.1 255.255.255.0

no sh

!

router ospf 1

router-id 1.1.1.1

net 0.0.0.0 0.0.0.0 a 0

!

end

R2

en

conf t

!

int fa0/0

ip add 172.16.1.2 255.255.255.0

no sh

!

int fa0/1

ip add 24.24.24.2 255.255.255.0

no sh

!

int fa1/0

ip add 25.25.25.2 255.255.255.0

no sh

!

router ospf 1

router-id 2.2.2.2

net 172.16.1.2 0.0.0.0 a 0

net 24.24.24.2 0.0.0.0 a 1

net 25.25.25.2 0.0.0.0 a 1

!

end

R3

en

conf t

!

int fa0/0

ip add 172.16.1.3 255.255.255.0

no sh

!

int fa1/0

ip add 34.34.34.3 255.255.255.0

no sh

!

int fa0/1

ip add 35.35.35.3 255.255.255.0

no sh

!

router ospf 1

router-id 3.3.3.3

net 172.16.1.3 0.0.0.0 a 0

net 34.34.34.3 0.0.0.0 a 1

net 35.35.35.3 0.0.0.0 a 1

!

end

R4

en

conf t

!

int fa 0/1

ip add 24.24.24.4 255.255.255.0

no sh

!

int fa 1/0

ip add 34.34.34.4 255.255.255.0

no sh

!

int fa0/0

ip add 192.168.1.4 255.255.255.0

no sh

!

router ospf 1

router-id 4.4.4.4

net 24.24.24.4 0.0.0.0 a 1

net 34.34.34.4 0.0.0.0 a 1

net 192.168.1.4 0.0.0.0 a 2

!

end

R5

en

conf t

!

int fa 0/1

ip add 35.35.35.5 255.255.255.0

no sh

!

int fa1/0

ip add 25.25.25.5 255.255.255.0

no sh

!

int fa0/0

ip add 192.168.1.5 255.255.255.0

no sh

!

router ospf 1

router-id 5.5.5.5

net 35.35.35.5 0.0.0.0 a 1

net 25.25.25.5 0.0.0.0 a 1

net 192.168.1.5 0.0.0.0 a 2

!

end

R6

en

conf t

int lo 0

ip add 60.1.1.1 255.255.255.0

no sh

!

int fa0/0

ip add 192.168.1.6 255.255.255.0

no sh

!

router ospf 1

router-id 6.6.6.6

net 60.1.1.1 0.0.0.0 a 2

net 192.168.1.6 0.0.0.0 a 2

!

end

完成如上配置后，等于完成了孤岛区域的模拟，R1 和R6是相互不学习路由的

R1#show ip route ospf

34.0.0.0/24 is subnetted, 1 subnets

O IA 34.34.34.0 [110/11] via 172.16.1.3, 00:03:24, FastEthernet0/0

35.0.0.0/24 is subnetted, 1 subnets

O IA 35.35.35.0 [110/20] via 172.16.1.3, 00:03:24, FastEthernet0/0

25.0.0.0/24 is subnetted, 1 subnets

O IA 25.25.25.0 [110/11] via 172.16.1.2, 00:03:24, FastEthernet0/0

24.0.0.0/24 is subnetted, 1 subnets

O IA 24.24.24.0 [110/20] via 172.16.1.2, 00:03:24, FastEthernet0/0

R1#

R6#show ip route ospf

R6#

R6#

如上现象表明，孤岛区域已经存在

步骤2：完成虚链路

R2

router ospf 1

area 1 vir 4.4.4.4

R4

router ospf 1

area 1 vir 2.2.2.2

R3

router ospf 1

area 1 vir 5.5.5.5

R5

router ospf 1

area 1 vir 3.3.3.3

完成如上配置后，我们会发现R6上同时以R4 R5 为下一跳，抵达10.1.1.0/24，现象如下：

R6#show ip route ospf

34.0.0.0/24 is subnetted, 1 subnets

O IA 34.34.34.0 [110/11] via 192.168.1.4, 00:00:39, FastEthernet0/0

35.0.0.0/24 is subnetted, 1 subnets

O IA 35.35.35.0 [110/20] via 192.168.1.5, 00:00:19, FastEthernet0/0

172.16.0.0/24 is subnetted, 1 subnets

O IA 172.16.1.0 [110/21] via 192.168.1.5, 00:00:04, FastEthernet0/0

[110/21] via 192.168.1.4, 00:00:05, FastEthernet0/0

25.0.0.0/24 is subnetted, 1 subnets

O IA 25.25.25.0 [110/11] via 192.168.1.5, 00:00:19, FastEthernet0/0

24.0.0.0/24 is subnetted, 1 subnets

O IA 24.24.24.0 [110/20] via 192.168.1.4, 00:00:39, FastEthernet0/0

10.0.0.0/32 is subnetted, 1 subnets

O IA 10.1.1.1 [110/22] via 192.168.1.5, 00:00:04, FastEthernet0/0

[110/22] via 192.168.1.4, 00:00:05, FastEthernet0/0

如上现象表明虚链路工作正常，但是路径信息未满足实验需求：

步骤3：修改R3的FA 0/0的接口开销，使得R6 优选R4 抵达10

R3

int fa0/0

ip ospf cost 100

此时关注R6 路由表中10网络的路径信息，现象如下：

R6#show ip route ospf

34.0.0.0/24 is subnetted, 1 subnets

O IA 34.34.34.0 [110/11] via 192.168.1.4, 00:00:30, FastEthernet0/0

35.0.0.0/24 is subnetted, 1 subnets

O IA 35.35.35.0 [110/20] via 192.168.1.5, 00:00:30, FastEthernet0/0

172.16.0.0/24 is subnetted, 1 subnets

O IA 172.16.1.0 [110/30] via 192.168.1.4, 00:00:20, FastEthernet0/0

25.0.0.0/24 is subnetted, 1 subnets

O IA 25.25.25.0 [110/11] via 192.168.1.5, 00:00:30, FastEthernet0/0

24.0.0.0/24 is subnetted, 1 subnets

O IA 24.24.24.0 [110/20] via 192.168.1.4, 00:00:30, FastEthernet0/0

10.0.0.0/32 is subnetted, 1 subnets

O IA 10.1.1.1 [110/31] via 192.168.1.4, 00:00:20, FastEthernet0/0

如上现象表明实验成功