实验4-4 OSPF单区域配置

学习目标

* **掌握OSPF中Router ID的配置方法**
* **掌握OSPF的配置方法**
* **掌握通过display命令查看OSPF运行状态的方法**
* **掌握使用OSPF发布缺省路由的方法**
* **掌握修改OSPF hello和dead时间的配置方法**
* **理解多路访问网络中的DR或BDR选举**
* **掌握OSPF路由优先级的修改方法**

## **拓扑图**

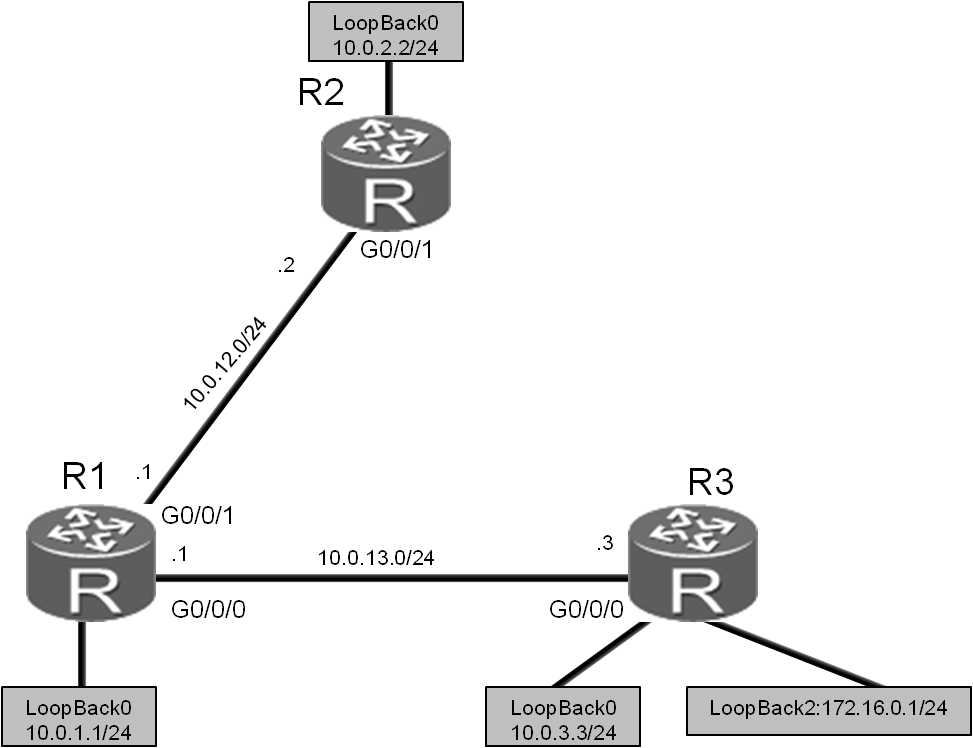


图4.4 OSPF单域配置实验拓扑图

场景

您是公司的网络管理员。现在公司网络中需要使用OSPF协议来进行路由信息的传递。规划网络中所有路由器属于OSPF的区域0。实际使用中需要向OSPF发布默认路由，此外您也希望通过这次部署了解DR/BDR选举的机制。

操作步骤

1. 实验环境准备

如果本任务中您使用的是空配置设备，需要从步骤1开始配置，然后跳过步骤2。如果使用的设备包含上一个实验的配置，请直接从步骤2开始配置。

基本配置以及IP编址。

<Huawei>system-view

Enter system view, return user view with Ctrl+Z.

[Huawei]sysname R1

[R1]interface GigabitEthernet 0/0/1

[R1-GigabitEthernet0/0/1]ip address 10.0.12.1 24

[R1-GigabitEthernet0/0/1]quit

[R1]interface GigabitEthernet 0/0/0

[R1-GigabitEthernet0/0/0]ip address 10.0.13.1 24

[R1-GigabitEthernet0/0/0]quit

[R1]interface LoopBack 0

[R1-LoopBack0]ip address 10.0.1.1 24

<Huawei>system-view

Enter system view, return user view with Ctrl+Z.

[Huawei]sysname R2

[R2]interface GigabitEthernet 0/0/1

[R2-GigabitEthernet0/0/1]ip address 10.0.12.2 24

[R2-GigabitEthernet0/0/1]quit

[R2]interface LoopBack 0

[R2-LoopBack0]ip address 10.0.2.2 24

<Huawei>system-view

Enter system view, return user view with Ctrl+Z.

[Huawei]sysname R3

[R3]interface GigabitEthernet 0/0/0

[R3-GigabitEthernet0/0/0]ip address 10.0.13.3 24

[R3-GigabitEthernet0/0/0]quit

[R3]interface LoopBack 0

[R3-LoopBack0]ip address 10.0.3.3 24

[R3-LoopBack0]quit

[R3]interface LoopBack 2

[R3-LoopBack2]ip address 172.16.0.1 24

1. 清除设备上原有的配置

打开必要的接口，关闭无关接口。

[R1]interface GigabitEthernet 0/0/1

[R1-GigabitEthernet0/0/1]undo shutdown

[R1-GigabitEthernet0/0/1]quit

[R2]interface GigabitEthernet 0/0/0

[R2-GigabitEthernet0/0/0]undo rip summary-address 172.16.0.0 255.255.0.0

[R2-GigabitEthernet0/0/0]shutdown

[R3]interface GigabitEthernet 0/0/0

[R3-GigabitEthernet0/0/0]undo shutdown

[R3-GigabitEthernet0/0/0]quit

[R3]interface GigabitEthernet 0/0/1

[R3-GigabitEthernet0/0/1]shutdown

[R3-GigabitEthernet0/0/1]quit

[R3]undo interface LoopBack 3

Info: This operation may take a few seconds. Please wait for a moment...succeeded.

[R3]undo interface LoopBack 4

Info: This operation may take a few seconds. Please wait for a moment...succeeded.

[R3]undo interface LoopBack 5

Info: This operation may take a few seconds. Please wait for a moment...succeeded.

删除设备上的RIP认证配置和RIP进程1。

[R1]interface GigabitEthernet 0/0/0

[R1-GigabitEthernet0/0/0]undo rip authentication-mode

[R1-GigabitEthernet0/0/0]quit

[R1]undo rip 1

Warning: The RIP process will be deleted. Continue?[Y/N]y

[R2]interface GigabitEthernet 0/0/0

[R2-GigabitEthernet0/0/0]undo rip authentication-mode

[R2-GigabitEthernet0/0/0]quit

[R2]interface GigabitEthernet 0/0/1

[R2-GigabitEthernet0/0/1]undo rip authentication-mode

[R2-GigabitEthernet0/0/1]quit

[R2]undo rip 1

Warning: The RIP process will be deleted. Continue?[Y/N]y

[R3]interface GigabitEthernet 0/0/1

[R3-GigabitEthernet0/0/1]undo rip authentication-mode

[R3-GigabitEthernet0/0/1]quit

[R3]undo rip 1

Warning: The RIP process will be deleted. Continue?[Y/N]y

1. 配置OSPF

将R1的Router ID配置为10.0.1.1（逻辑接口Loopback 0的地址），开启OSPF进程1（缺省进程），并将网段10.0.1.0/24、10.0.12.0/24和10.0.13.0/24发布到OSPF区域0。

[R1]ospf 1 router-id 10.0.1.1

[R1-ospf-1]area 0

[R1-ospf-1-area-0.0.0.0]network 10.0.1.0 0.0.0.255

[R1-ospf-1-area-0.0.0.0]network 10.0.13.0 0.0.0.255

[R1-ospf-1-area-0.0.0.0]network 10.0.12.0 0.0.0.255

注意：同一个路由器可以开启多个OSPF进程，默认进程号为1，由于进程号只具有本地意义，所以同一路由域的不同路由器可以使用相同或不同的OSPF进程号。另外**network**命令后面需使用反掩码。

将R2的Router ID配置为10.0.2.2，开启OSPF进程1，并将网段10.0.12.0/24和10.0.2.0/24发布到OSPF区域0。

[R2]ospf 1 router-id 10.0.2.2

[R2-ospf-1]area 0

[R2-ospf-1-area-0.0.0.0]network 10.0.2.0 0.0.0.255

[R2-ospf-1-area-0.0.0.0]network 10.0.12.0 0.0.0.255

…output omit…

Mar 30 2016 09:41:39+00:00 R2 %%01OSPF/4/NBR\_CHANGE\_E(l)[5]:Neighbor changes event: neighbor status changed. (ProcessId=1, NeighborAddress=10.0.12.1, NeighborEvent=LoadingDone, NeighborPreviousState=Loading, NeighborCurrentState=Full)

当回显信息中包含“NeighborCurrentState=Full”信息时，表明邻接关系已经建立。

将R3的Router ID配置为10.0.3.3，开启OSPF进程1，并将网段10.0.3.0/24和10.0.13.0/24发布到OSPF区域0。

[R3]ospf 1 router-id 10.0.3.3

[R3-ospf-1]area 0

[R3-ospf-1-area-0.0.0.0]network 10.0.3.0 0.0.0.255

[R3-ospf-1-area-0.0.0.0]network 10.0.13.0 0.0.0.255

…output omit…

Mar 30 2016 16:05:34+00:00 R3 %%01OSPF/4/NBR\_CHANGE\_E(l)[5]:Neighbor changes event: neighbor status changed. (ProcessId=1, NeighborAddress=10.0.13.1, NeighborEvent=LoadingDone, NeighborPreviousState=Loading, NeighborCurrentState=Full)

1. 验证OSPF配置

待OSPF收敛完成后，查看R1、R2和R3上的路由表。

<R1>display ip routing-table

Route Flags: R - relay, D - download to fib

-------------------------------------------------------------------------

Routing Tables: Public

Destinations : 15 Routes : 15

Destination/Mask Proto Pre Cost Flags NextHop Interface

10.0.1.0/24 Direct 0 0 D 10.0.1.1 LoopBack0

10.0.1.1/32 Direct 0 0 D 127.0.0.1 LoopBack0

10.0.1.255/32 Direct 0 0 D 127.0.0.1 LoopBack0

10.0.2.2/32 OSPF 10 1 D 10.0.12.2 GigabitEthernet0/0/1

10.0.3.3/32 OSPF 10 1 D 10.0.13.3 GigabitEthernet0/0/0

10.0.12.0/24 Direct 0 0 D 10.0.12.1 GigabitEthernet0/0/1

10.0.12.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/1

10.0.12.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/1

10.0.13.0/24 Direct 0 0 D 10.0.13.1 GigabitEthernet0/0/0

10.0.13.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/0

10.0.13.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/0

127.0.0.0/8 Direct 0 0 D 127.0.0.1 InLoopBack0

127.0.0.1/32 Direct 0 0 D 127.0.0.1 InLoopBack0

127.255.255.255/32 Direct 0 0 D 127.0.0.1 InLoopBack0

255.255.255.255/32 Direct 0 0 D 127.0.0.1 InLoopBack0

<R2>display ip routing-table

Route Flags: R - relay, D - download to fib

-------------------------------------------------------------------------

Routing Tables: Public

Destinations : 13 Routes : 13

Destination/Mask Proto Pre Cost Flags NextHop Interface

10.0.1.1/32 OSPF 10 1 D 10.0.12.1 GigabitEthernet0/0/1

10.0.2.0/24 Direct 0 0 D 10.0.2.2 LoopBack0

10.0.2.2/32 Direct 0 0 D 127.0.0.1 LoopBack0

10.0.2.255/32 Direct 0 0 D 127.0.0.1 LoopBack0

10.0.3.3/32 OSPF 10 2 D 10.0.12.1 GigabitEthernet0/0/1

10.0.12.0/24 Direct 0 0 D 10.0.12.2 GigabitEthernet0/0/1

10.0.12.2/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/1

10.0.12.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/1

10.0.13.0/24 OSPF 10 2 D 10.0.12.1 GigabitEthernet0/0/1

127.0.0.0/8 Direct 0 0 D 127.0.0.1 InLoopBack0

127.0.0.1/32 Direct 0 0 D 127.0.0.1 InLoopBack0

127.255.255.255/32 Direct 0 0 D 127.0.0.1 InLoopBack0

255.255.255.255/32 Direct 0 0 D 127.0.0.1 InLoopBack0

<R3>display ip routing-table

Route Flags: R - relay, D - download to fib

-------------------------------------------------------------------------

Routing Tables: Public

Destinations : 16 Routes : 16

Destination/Mask Proto Pre Cost Flags NextHop Interface

10.0.1.1/32 OSPF 10 1 D 10.0.13.1 GigabitEthernet0/0/0

10.0.2.2/32 OSPF 10 2 D 10.0.13.1 GigabitEthernet0/0/0

10.0.3.0/24 Direct 0 0 D 10.0.3.3 LoopBack0

10.0.3.3/32 Direct 0 0 D 127.0.0.1 LoopBack0

10.0.3.255/32 Direct 0 0 D 127.0.0.1 LoopBack0

10.0.12.0/24 OSPF 10 2 D 10.0.13.1 GigabitEthernet0/0/0

10.0.13.0/24 Direct 0 0 D 10.0.13.3 GigabitEthernet0/0/0

10.0.13.3/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/0

10.0.13.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/0

127.0.0.0/8 Direct 0 0 D 127.0.0.1 InLoopBack0

127.0.0.1/32 Direct 0 0 D 127.0.0.1 InLoopBack0

127.255.255.255/32 Direct 0 0 D 127.0.0.1 InLoopBack0

172.16.0.0/24 Direct 0 0 D 172.16.0.1 LoopBack2

172.16.0.1/32 Direct 0 0 D 127.0.0.1 LoopBack2

172.16.0.255/32 Direct 0 0 D 127.0.0.1 LoopBack2

255.255.255.255/32 Direct 0 0 D 127.0.0.1 InLoopBack0

检测R2和R1（10.0.1.1）以及R2和R3（10.0.3.3）间的连通性。

<R2>ping 10.0.1.1

PING 10.0.1.1: 56 data bytes, press CTRL\_C to break

Reply from 10.0.1.1: bytes=56 Sequence=1 ttl=255 time=37 ms

Reply from 10.0.1.1: bytes=56 Sequence=2 ttl=255 time=42 ms

Reply from 10.0.1.1: bytes=56 Sequence=3 ttl=255 time=42 ms

Reply from 10.0.1.1: bytes=56 Sequence=4 ttl=255 time=45 ms

Reply from 10.0.1.1: bytes=56 Sequence=5 ttl=255 time=42 ms

--- 10.0.1.1 ping statistics ---

5 packet(s) transmitted

5 packet(s) received

0.00% packet loss

round-trip min/avg/max = 37/41/45 ms

<R2>ping 10.0.3.3

PING 10.0.3.3: 56 data bytes, press CTRL\_C to break

Reply from 10.0.3.3: bytes=56 Sequence=1 ttl=254 time=37 ms

Reply from 10.0.3.3: bytes=56 Sequence=2 ttl=254 time=42 ms

Reply from 10.0.3.3: bytes=56 Sequence=3 ttl=254 time=42 ms

Reply from 10.0.3.3: bytes=56 Sequence=4 ttl=254 time=42 ms

Reply from 10.0.3.3: bytes=56 Sequence=5 ttl=254 time=42 ms

--- 10.0.3.3 ping statistics ---

5 packet(s) transmitted

5 packet(s) received

0.00% packet loss

round-trip min/avg/max = 37/41/42 ms

执行**display ospf peer**命令，查看OSPF邻居状态。

<R1>display ospf peer

OSPF Process 1 with Router ID 10.0.1.1

Neighbors

Area 0.0.0.0 interface 10.0.12.1(GigabitEthernet0/0/1)'s neighbors

Router ID: 10.0.2.2 Address: 10.0.12.2

State: Full Mode:Nbr is Master Priority: 1

DR: 10.0.12.1 BDR: 10.0.12.2 MTU: 0

Dead timer due in 32 sec

Retrans timer interval: 5

Neighbor is up for 00:47:59

Authentication Sequence: [ 0 ]

Neighbors

Area 0.0.0.0 interface 10.0.13.1(GigabitEthernet0/0/0)'s neighbors

Router ID: 10.0.3.3 Address: 10.0.13.3

State: Full Mode:Nbr is Master Priority: 1

DR: 10.0.13.1 BDR: 10.0.13.3 MTU: 0

Dead timer due in 34 sec

Retrans timer interval: 5

Neighbor is up for 00:41:44

Authentication Sequence: [ 0 ]

**display ospf peer**命令显示所有OSPF邻居的详细信息。本任务中，在10.0.13.0网段上R1是DR。由于DR选举是非抢占模式，如果OSPF进程不重启，R3将不会取代R1的DR角色。

执行**display ospf peer brief**命令，可以查看简要的OSPF邻居信息。

<R1>display ospf peer brief

OSPF Process 1 with Router ID 10.0.1.1

Peer Statistic Information

-------------------------------------------------------------------------

Area Id Interface Neighbor id State

0.0.0.0 GigabitEthernet0/0/0 10.0.3.3 Full

0.0.0.0 GigabitEthernet0/0/1 10.0.2.2 Full

-------------------------------------------------------------------------

<R2>display ospf peer brief

OSPF Process 1 with Router ID 10.0.2.2

Peer Statistic Information

-------------------------------------------------------------------------

Area Id Interface Neighbor id State

0.0.0.0 GigabitEthernet0/0/1 10.0.1.1 Full

-------------------------------------------------------------------------

<R3>display ospf peer brief

OSPF Process 1 with Router ID 10.0.3.3

Peer Statistic Information

-------------------------------------------------------------------------

Area Id Interface Neighbor id State

0.0.0.0 GigabitEthernet0/0/0 10.0.1.1 Full

-------------------------------------------------------------------------

1. 修改OSPF hello和dead时间参数

在R1上执行**display ospf interface GigabitEthernet 0/0/0**命令，查看OSPF默认的hello和dead时间。

<R1>display ospf interface GigabitEthernet 0/0/0

OSPF Process 1 with Router ID 10.0.1.1

Interfaces

Interface: 10.0.13.1 (GigabitEthernet0/0/0)

Cost: 1 State: DR Type: Broadcast MTU: 1500

Priority: 1

Designated Router: 10.0.13.1

Backup Designated Router: 10.0.13.3

Timers: Hello 10 , Dead 40 , Poll 120 , Retransmit 5 , Transmit Delay 1

在R1的GE0/0/0接口执行**ospf timer**命令，将OSPF hello和dead时间分别修改为15秒和60秒。

[R1]interface GigabitEthernet 0/0/0

[R1-GigabitEthernet0/0/0]ospf timer hello 15

[R1-GigabitEthernet0/0/0]ospf timer dead 60

Mar 30 2016 16:58:39+00:00 R1 %%01OSPF/3/NBR\_DOWN\_REASON(l)[1]:Neighbor state leaves full or changed to Down. (ProcessId=1, NeighborRouterId=10.0.3.3, NeighborAreaId=0, NeighborInterface=GigabitEthernet0/0/0,NeighborDownImmediate reason=Neighbor Down Due to Inactivity, NeighborDownPrimeReason=Interface Parameter Mismatch, NeighborChangeTime=2013-11-30 16:58:39)

<R1>display ospf interface GigabitEthernet 0/0/0

OSPF Process 1 with Router ID 10.0.1.1

Interfaces

Interface: 10.0.13.1 (GigabitEthernet0/0/0)

Cost: 1 State: DR Type: Broadcast MTU: 1500

Priority: 1

Designated Router: 10.0.13.1

Backup Designated Router: 10.0.13.3

Timers: Hello 15 , Dead 60 , Poll 120 , Retransmit 5 , Transmit Delay 1

在R1上查看OSPF邻居状态。

<R1>display ospf peer brief

OSPF Process 1 with Router ID 10.0.1.1

Peer Statistic Information

-------------------------------------------------------------------------

Area Id Interface Neighbor id State

0.0.0.0 GigabitEthernet0/0/1 10.0.2.2 Full

-------------------------------------------------------------------------

上述回显信息表明，R1只有一个邻居，那就是R2。因为R1和R3上的OSPF hello和dead时间取值不同，所以R1无法与R3建立OSPF邻居关系。

在R3的GE0/0/0接口执行**ospf timer**命令，将OSPF hello和dead时间分别修改为15秒和60秒。

[R3]interface GigabitEthernet 0/0/0

[R3-GigabitEthernet0/0/0]ospf timer hello 15

[R3-GigabitEthernet0/0/0]ospf timer dead 60

…output omit…

Mar 30 2016 17:03:33+00:00 R3 %%01OSPF/4/NBR\_CHANGE\_E(l)[4]:Neighbor changes event: neighbor status changed. (ProcessId=1, NeighborAddress=10.0.13.1, NeighborEvent=LoadingDone, NeighborPreviousState=Loading, NeighborCurrentState=Full)

<R3>display ospf interface GigabitEthernet 0/0/0

OSPF Process 1 with Router ID 10.0.3.3

Interfaces

Interface: 10.0.13.3 (GigabitEthernet0/0/0)

Cost: 1 State: DR Type: Broadcast MTU: 1500

Priority: 1

Designated Router: 10.0.13.3

Backup Designated Router: 10.0.13.1

Timers: Hello 15 , Dead 60 , Poll 120 , Retransmit 5 , Transmit Delay 1

再次在R1上查看OSPF邻居状态。

<R1>display ospf peer brief

OSPF Process 1 with Router ID 10.0.1.1

Peer Statistic Information

------------------------------------------------------------------------

Area Id Interface Neighbor id State

0.0.0.0 GigabitEthernet0/0/0 10.0.3.3 Full

0.0.0.0 GigabitEthernet0/0/1 10.0.2.2 Full

-------------------------------------------------------------------------

1. OSPF缺省路由发布及验证

在R3上配置缺省路由并发布到OSPF域内。

[R3]ip route-static 0.0.0.0 0.0.0.0 LoopBack 2

[R3]ospf 1

[R3-ospf-1]default-route-advertise

查看R1和R2的路由表。可以看到，R1和R2均已经学习到了R3发布的缺省路由。

<R1>display ip routing-table

Route Flags: R - relay, D - download to fib

-------------------------------------------------------------------------

Routing Tables: Public

Destinations : 16 Routes : 16

Destination/Mask Proto Pre Cost Flags NextHop Interface

0.0.0.0/0 O\_ASE 150 1 D 10.0.13.3 GigabitEthernet0/0/0

10.0.1.0/24 Direct 0 0 D 10.0.1.1 LoopBack0

10.0.1.1/32 Direct 0 0 D 127.0.0.1 LoopBack0

10.0.1.255/32 Direct 0 0 D 127.0.0.1 LoopBack0

10.0.2.2/32 OSPF 10 1 D 10.0.12.2 GigabitEthernet0/0/1

10.0.3.3/32 OSPF 10 1 D 10.0.13.3 GigabitEthernet0/0/0

10.0.12.0/24 Direct 0 0 D 10.0.12.1 GigabitEthernet0/0/1

10.0.12.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/1

10.0.12.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/1

10.0.13.0/24 Direct 0 0 D 10.0.13.1 GigabitEthernet0/0/0

10.0.13.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/0

10.0.13.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/0

127.0.0.0/8 Direct 0 0 D 127.0.0.1 InLoopBack0

127.0.0.1/32 Direct 0 0 D 127.0.0.1 InLoopBack0

127.255.255.255/32 Direct 0 0 D 127.0.0.1 InLoopBack0

255.255.255.255/32 Direct 0 0 D 127.0.0.1 InLoopBack0

<R2>display ip routing-table

Route Flags: R - relay, D - download to fib

-------------------------------------------------------------------------

Routing Tables: Public

Destinations : 14 Routes : 14

Destination/Mask Proto Pre Cost Flags NextHop Interface

0.0.0.0/0 O\_ASE 150 1 D 10.0.12.1 GigabitEthernet0/0/1

10.0.1.1/32 OSPF1 0 1 D 10.0.12.1 GigabitEthernet0/0/1

10.0.2.0/24 Direct 0 0 D 10.0.2.2 LoopBack0

10.0.2.2/32 Direct 0 0 D 127.0.0.1 LoopBack0

10.0.2.255/32 Direct 0 0 D 127.0.0.1 LoopBack0

10.0.3.3/32 OSPF 10 2 D 10.0.12.1 GigabitEthernet0/0/1

10.0.12.0/24 Direct 0 0 D 10.0.12.2 GigabitEthernet0/0/1

10.0.12.2/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/1

10.0.12.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/1

10.0.13.0/24 OSPF 10 2 D 10.0.12.1 GigabitEthernet0/0/1

127.0.0.0/8 Direct 0 0 D 127.0.0.1 InLoopBack0

127.0.0.1/32 Direct 0 0 D 127.0.0.1 InLoopBack0

127.255.255.255/32 Direct 0 0 D 127.0.0.1 InLoopBack0

255.255.255.255/32 Direct 0 0 D 127.0.0.1 InLoopBack0

<R3>display ip routing-table

Route Flags: R - relay, D - download to fib

-------------------------------------------------------------------------

Routing Tables: Public

Destinations : 17 Routes : 17

Destination/Mask Proto Pre Cost Flags NextHop Interface

0.0.0.0/0 Static 60 0 D 172.16.0.1 LoopBack2

10.0.1.1/32 OSPF 10 1 D 10.0.13.1 GigabitEthernet0/0/0

10.0.2.2/32 OSPF 10 2 D 10.0.13.1 GigabitEthernet0/0/0

10.0.3.0/24 Direct 0 0 D 10.0.3.3 LoopBack0

10.0.3.3/32 Direct 0 0 D 127.0.0.1 LoopBack0

10.0.3.255/32 Direct 0 0 D 127.0.0.1 LoopBack0

10.0.12.0/24 OSPF 10 2 D 10.0.13.1 GigabitEthernet0/0/0

10.0.13.0/24 Direct 0 0 D 10.0.13.3 GigabitEthernet0/0/0

10.0.13.3/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/0

10.0.13.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet0/0/0

127.0.0.0/8 Direct 0 0 D 127.0.0.1 InLoopBack0

127.0.0.1/32 Direct 0 0 D 127.0.0.1 InLoopBack0

127.255.255.255/32 Direct 0 0 D 127.0.0.1 InLoopBack0

172.16.0.0/24 Direct 0 0 D 172.16.0.1 LoopBack2

172.16.0.1/32 Direct 0 0 D 127.0.0.1 LoopBack2

172.16.0.255/32 Direct0 0 D 127.0.0.1 LoopBack2

255.255.255.255/32 Direct0 0 D 127.0.0.1 InLoopBack0

使用**ping**命令，检测R2与172.16.0.1/24网段之间的连通性。

<R2>ping 172.16.0.1

PING 172.16.0.1: 56 data bytes, press CTRL\_C to break

Reply from 172.16.0.1: bytes=56 Sequence=1 ttl=254 time=47 ms

Reply from 172.16.0.1: bytes=56 Sequence=2 ttl=254 time=37 ms

Reply from 172.16.0.1: bytes=56 Sequence=3 ttl=254 time=37 ms

Reply from 172.16.0.1: bytes=56 Sequence=4 ttl=254 time=37 ms

Reply from 172.16.0.1: bytes=56 Sequence=5 ttl=254 time=37 ms

--- 172.16.0.1 ping statistics ---

5 packet(s) transmitted

5 packet(s) received

0.00% packet loss

round-trip min/avg/max = 37/39/47 ms

1. 控制OSPF DR/BDR的选举

执行**display ospf peer**命令，查看R1和R3的DR/BDR角色。

<R1>display ospf peer 10.0.3.3

OSPF Process 1 with Router ID 10.0.1.1

Neighbors

Area 0.0.0.0 interface 10.0.13.1(GigabitEthernet0/0/0)'s neighbors

Router ID: 10.0.3.3 Address: 10.0.13.3

State: Full Mode:Nbr is Master Priority: 1

DR: 10.0.13.3 BDR: 10.0.13.1 MTU: 0

Dead timer due in 49 sec

Retrans timer interval: 5

Neighbor is up for 00:17:40

Authentication Sequence: [ 0 ]

上述回显信息表明，由于默认OSPF路由器优先级（数值为1）相同，但R3的Router ID 10.0.3.3大于R1的Router ID 10.0.1.1，所以R3为DR，R1为BDR。

执行**ospf dr-priority**命令，修改R1和R3的DR优先级。

[R1]interface GigabitEthernet 0/0/0

[R1-GigabitEthernet0/0/0]ospf dr-priority 200

[R3]interface GigabitEthernet 0/0/0

[R3-GigabitEthernet0/0/0]ospf dr-priority 100

默认情况下，DR/BDR的选举采用的是非抢占模式。路由器优先级修改后，不会自动重新选举DR。因此，需要重置R1和R3间的OSPF邻居关系。

先关闭然后再打开R1和R3上的Gigabit Ethernet 0/0/0接口，重置R1和R3间的OSPF邻居关系。

[R3]interface GigabitEthernet0/0/0

[R3-GigabitEthernet0/0/0]shutdown

[R1]interface GigabitEthernet0/0/0

[R1-GigabitEthernet0/0/0]shutdown

[R1-GigabitEthernet0/0/0]undo shutdown

[R3-GigabitEthernet0/0/0]undo shutdown

执行**display ospf peer**命令，查看R1和R3的DR/BDR角色。

[R1]display ospf peer 10.0.3.3

OSPF Process 1 with Router ID 10.0.1.1

Neighbors

Area 0.0.0.0 interface 10.0.13.1(GigabitEthernet0/0/0)'s neighbors

Router ID: 10.0.3.3 Address: 10.0.13.3

State: Full Mode:Nbr is Master Priority: 100

DR: 10.0.13.1 BDR: 10.0.13.3 MTU: 0

Dead timer due in 52 sec

Retrans timer interval: 5

Neighbor is up for 00:00:25

Authentication Sequence: [ 0 ]

上述信息表明，R1的DR优先级高于R3，因此R1被选举为DR，而R3成为了BDR。

## **配置文件**

<R1>display current-configuration

[V200R007C00SPC600]

#

sysname R1

#

interface GigabitEthernet0/0/0

ip address 10.0.13.1 255.255.255.0

ospf dr-priority 200

ospf timer hello 15

#

interface GigabitEthernet0/0/1

ip address 10.0.12.1 255.255.255.0

#

interface LoopBack0

ip address 10.0.1.1 255.255.255.0

#

ospf 1 router-id 10.0.1.1

area 0.0.0.0

network 10.0.1.0 0.0.0.255

network 10.0.12.0 0.0.0.255

network 10.0.13.0 0.0.0.255

#

user-interface con 0

authentication-mode password

set authentication password cipher %$%$+L'YR&IZt'4,)>-\*#lH",}%K-oJ\_M9+'lOU~bD (\WTqB}%N,%$%$

user-interface vty 0 4

#

return

<R2>display current-configuration

[V200R007C00SPC600]

#

sysname R2

#

interface GigabitEthernet0/0/1

ip address 10.0.12.2 255.255.255.0

#

interface LoopBack0

ip address 10.0.2.2 255.255.255.0

#

ospf 1 router-id 10.0.2.2

area 0.0.0.0

network 10.0.2.0 0.0.0.255

network 10.0.12.0 0.0.0.255

#

user-interface con 0

authentication-mode password

set authentication password cipher %$%$1=cd%b%/O%Id-8X:by1N,+s}'4wD6TvO<I|/pd# #44C@+s#,%$%$

user-interface vty 0 4

#

return

<R3>display current-configuration

[V200R007C00SPC600]

#

sysname R3

#

interface GigabitEthernet0/0/0

ip address 10.0.13.3 255.255.255.0

ospf dr-priority 100

ospf timer hello 15

#

interface LoopBack0

ip address 10.0.3.3 255.255.255.0

#

interface LoopBack2

ip address 172.16.0.1 255.255.255.0

#

ospf 1 router-id 10.0.3.3

default-route-advertise

area 0.0.0.0

network 10.0.3.0 0.0.0.255

network 10.0.13.0 0.0.0.255

#

ip route-static 0.0.0.0 0.0.0.0 LoopBack2

#

user-interface con 0

authentication-mode password

set authentication password cipher %$%$ksXDMg7Ry6yUU:63:DQ),#/sQg"@\*S\U#.s.bHW xQ,y%#/v,%$%$

user-interface vty 0 4

#

return