Lab 3: OSPF Single-Area Configuration

Learning Objectives

As a result of this lab section, you should achieve the following tasks:

- Configuration of the Router-ID for OSPF.
- Establish OSPF on a specified interface or network.
- View OSPF operations using display commands.
- Advertisement of default routes in OSPF.
- Change of the OSPF hello interval and dead interval.
- Familiarization with DR or BDR election on multi-access networks.
- Change of the OSPF route priority to manipulate DR election.

Topology

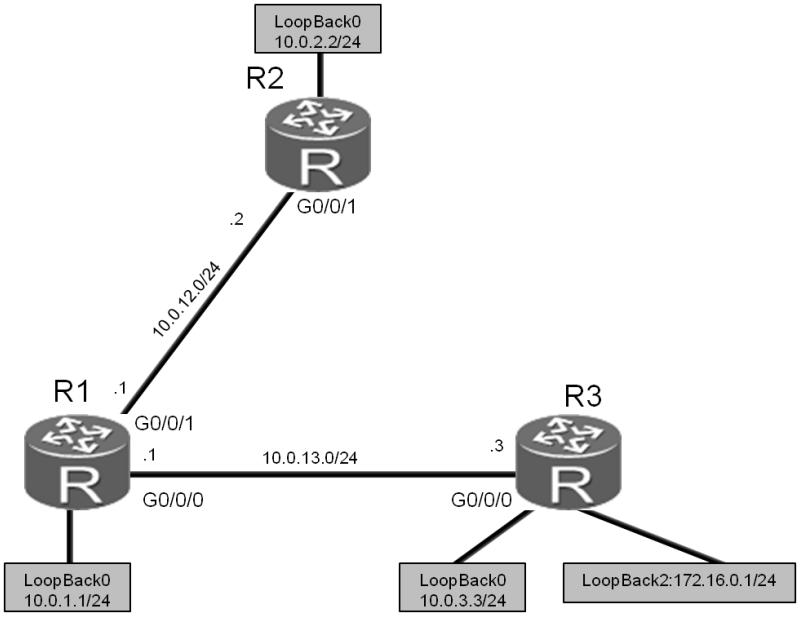

Figure 4.4 OSPF single area topology

Scenario

As the network administrator of an establishing small enterprise, it is required that a network be implemented using OSPF. Then network is to support a single area and with consideration for future expansion it is requested that this area be set as area 0. OSPF is required to advertise default routes and also elect both a DR and BDR for network resiliency.

Tasks

Step 1 **Prepare the environment**

If you are starting this section with a non-configured device, begin here and then move to step 3.

Establish the basic system configuration and addressing for the lab.

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R1
[R1]interface GigabitEthernet 0/0/1
[R1-GigabitEthernet 0/0/1]ip address 10.0.12.1 24
[R1-GigabitEthernet 0/0/1]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-GigabitEthernet 0/0/1]ip address 10.0.12.2 24
[R2-GigabitEthernet 0/0/1]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
```

Step 2 **Configure OSPF.**

Assign the value 10.0.1.1 (as used on logical interface loopback 0 for simplicity) as the router ID. Use OSPF process 1 (the default process), and specify network segments 10.0.1.0/24, 10.0.12.0/24, and 10.0.13.0/24 as part of OSPF area 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
```

Different process ID's will generate multiple link state databases, therefore ensure that all routers use the same OSPF process ID. The wildcard mask must be specified as part of the **network** command.

Manually assign the value 10.0.2.2 as the router ID. Use OSPF process 1, and advertise network segments 10.0.12.0/24 and 10.0.2.0/24 into OSPF area 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 omitted…
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)
```

Adjacency is attained when "NeighborCurrentState=Full" . For R3, Manually assign the value 10.0.3.3 as the router ID. Use OSPF process 1, and advertise network segments 10.0.3.0/24 and 10.0.13.0/24 into OSPF area 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 omitted…
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)
```

Step 3**Verify the OSPF configuration.**

After OSPF route convergence is complete, view routing tables of R1, R2, and R3.

```
<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
```

Test network connectivity between R2 and R1 at 10.0.1.1 and between R2 and R3 at 10.0.3.3.

```
<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
```

Run the **display ospf peer** command to view the OSPF neighbor status.

```
<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 ]
```

The **display ospf peer** command displays detailed information about any peering neighbors. In the example given, the link 10.0.13.1 of R1 shows to be the DR. The DR election is non pre-emptive, meaning that the link of R3 will not take over the role of DR from R1 unless the OSPF process is reset.

The **display ospf peer brief** command can also be used to display a condensed version of the OSPF peer information.

```
<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
 ----------------------------------------------------------------------------
```

Step 4 **Change the OSPF hello interval and dead interval.**

Run the **display ospf interface GigabitEthernet 0/0/0** command on R1 to view the default OSPF hello interval and dead interval.

```
<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
```

Run the **ospf timer** command to change the OSPF hello interval and dead interval on GE0/0/0 of R1 to 15s and 60s respectively.

```
[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=2016-03-30 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
```

Check the OSPF neighbor status on R1.

```
<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
 ----------------------------------------------------------------------------
```

The preceding information shows that R1 has only one neighbor, R2. Since the OSPF hello intervals and dead intervals on R1 and R3 are different, R1 and R3 will fail to establish an OSPF neighbor relationship.

Run the **ospf timer** command to change the OSPF hello interval and dead interval on GE0/0/0 of R3 to 15s and 60s respectively.

```
[R3]interface GigabitEthernet 0/0/0
[R3-GigabitEthernet0/0/0]ospf timer hello 15
[R3-GigabitEthernet0/0/0]ospf timer dead 60
…output omitted…
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
```

Check the OSPF neighbor status on R1 again.

```
<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
----------------------------------------------------------------------------
```

Step 5 **Advertise default routes in OSPF.**

Configure OSPF to advertise default routes on R3.

```
[R3]ip route-static 0.0.0.0 0.0.0.0 LoopBack 2
[R3]ospf 1
[R3-ospf-1]default-route-advertise
```

View routing tables of R1 and R2. You can see that R1 and R2 have learned the default routes advertised by R3.

```
<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 Direct 0    0          D   127.0.0.1 LoopBack2
255.255.255.255/32  Direct 0    0          D   127.0.0.1 InLoopBack0
```

Run the **ping** command to test connectivity between R2 and Loopback2 at 172.16.0.1.

```
<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
```

Step 6 **Control OSPF DR or BDR election.**

Run the **display ospf peer** command to view the DR and BDR of R1 and R3.

```
<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 ]
```

The preceding information shows that R3 is the DR and R1 is the BDR. This is because R3's router ID 10.0.3.3 is greater than R1's router ID 10.0.1.1. R1 and R3 use the default priority of 1, so their router IDs are used for DR or BDR election.

Run the **ospf dr-priority** command to change DR priorities of R1 and R3.

```
[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
```

A DR or BDR is elected in non-preemption mode, by default. After router priorities are changed, a DR is not re-elected, so you must reset the OSPF neighbor relationship between R1 and R3.

Shut down and re-enable Gigabit Ethernet 0/0/0 interfaces on R1 and R3 to reset the OSPF neighbor relationship between R1 and R3.

```
[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
```

Run the **display ospf peer** command to view the DR and BDR of R1 and R3.

```
[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 ]
```

According to the preceding information, R1's priority is higher than R3's priority, so R1 becomes DR and R3 becomes the BDR.

Final Configuration

```
<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 (\WTq
B}%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
```