

Lab 4-4 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

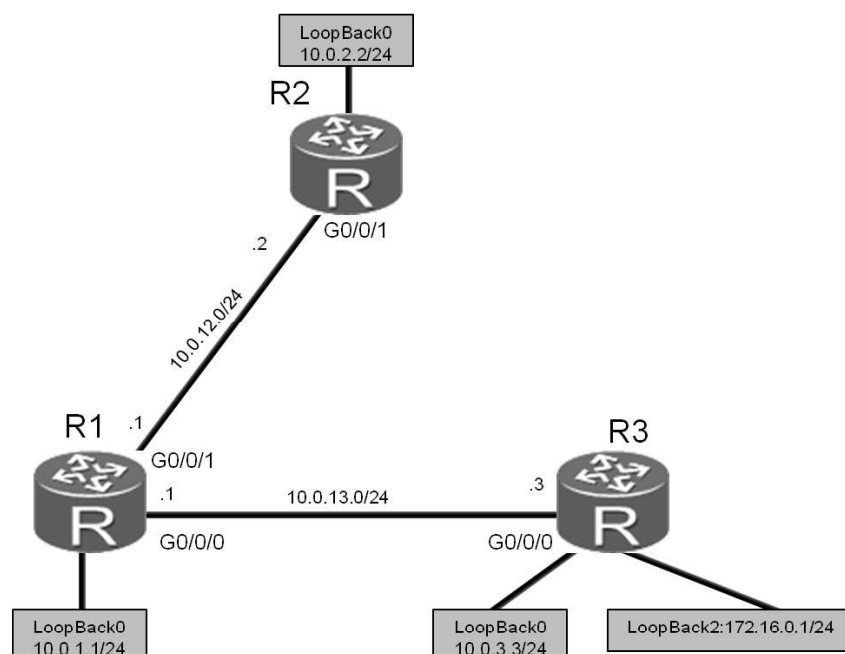


Figure 4.4 OSPF single area topology

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. For those continuing from previous labs, begin at step 2.

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 **Clean up the previous configuration.**

Enable the interfaces necessary for this lab and disable those not needed.

```
[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.
```

Remove the configured RIP authentication and RIP 1 process.

```
[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
```

Step 3 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...

```
Nov 30 2013 09:41:39+00:00 R2 %%01OSPF/4/NBR_CHANGE_E(1)[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...

```
Nov 30 2013 16:05:34+00:00 R3 %%01OSPF/4/NBR_CHANGE_E(1)[5]:Neighbor changes event:
neighbor status changed. (ProcessId=1, NeighborAddress=10.0.13.1,
NeighborEvent=LoadingDone, NeighborPreviousState=Loading, NeighborCurrentState=Full)
```

Step 4 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 5 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
Nov 30 2013 16:58:39+00:00 R1 %%01OSPF/3/NBR_DOWN_REASON(1)[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
```

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...
Nov 30 2013 17:03:33+00:00 R3 %%01OSPF/4/NBR_CHANGE_E(1)[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 6 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 7 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
[V200R003C00SPC200]
#
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
[V200R003C00SPC200]
#
    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
[V200R003C00SPC200]
#
    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
```