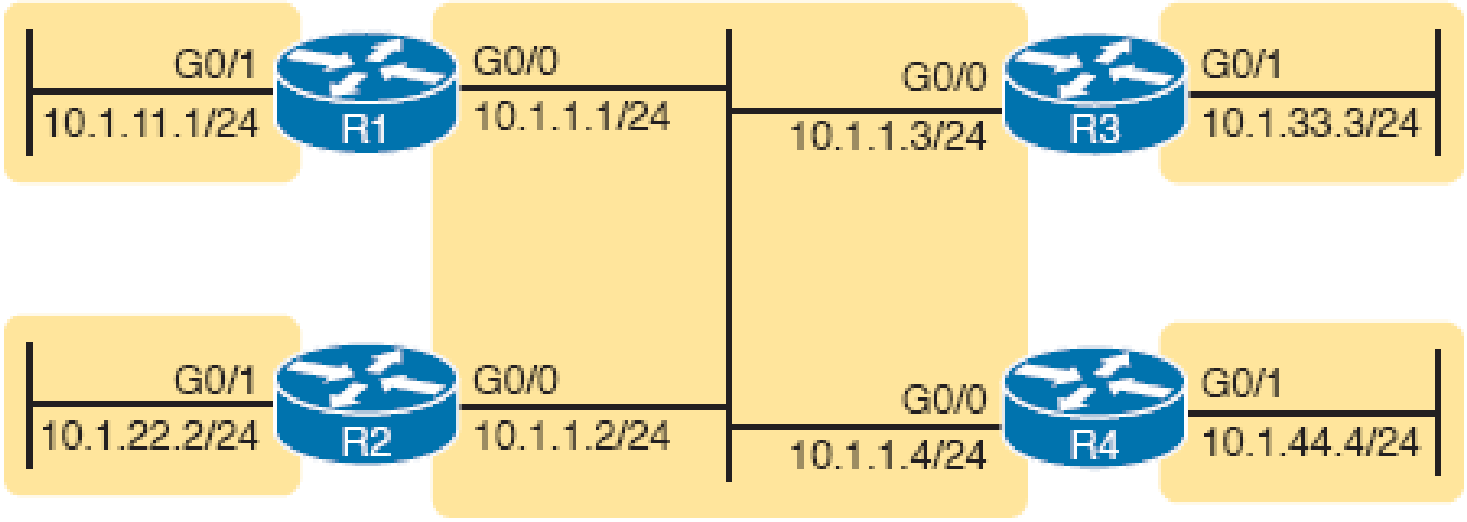
CCNA 200-301, Volume I

Chapter 21
OSPF Network Types and Neighbors

Objectives

- OSFP Network Types
- OSPF Neighbor Relationships

The OSPF Broadcast Network Type



R1 OSPF Configuration

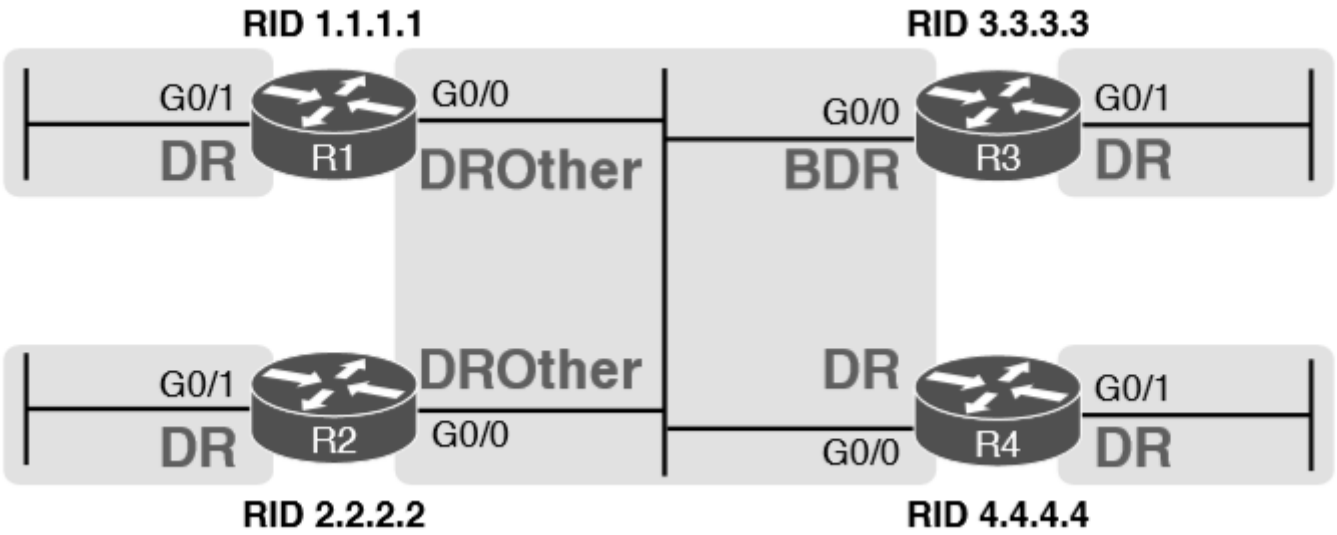
```
router ospf 1
 router-id 1.1.1.1
!
interface gigabitEthernet0/0
 ip ospf 1 area 0
!
interface gigabitEthernet0/1
 ip ospf 1 area 0
```

R1's List of Neighbors

```
R1# show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
2.2.2.2           1   2WAY/DROTHER    00:00:35    10.1.1.2        GigabitEthernet0/0
3.3.3.3           1   FULL/BDR        00:00:33    10.1.1.3        GigabitEthernet0/0
4.4.4.4           1   FULL/DR         00:00:35    10.1.1.4        GigabitEthernet0/0
```

OSPF DR/BDR/DROther Roles in the Network



Router R1 OSPF Interfaces: Local Role and Neighbor Counts

```
R1# show ip ospf interface brief
Interface    PID   Area            IP Address/Mask    Cost  State Nbrs F/C
Gi0/1        1     0               10.1.11.1/24       1     DR    0/0
Gi0/0        1     0               10.1.1.1/24        1     DROTH 2/3
```

Displaying OSPF Network Type Broadcast

```
R1# show ip ospf interface g0/0
GigabitEthernet0/0 is up, line protocol is up
  Internet Address 10.1.1.1/24, Area 0, Attached via Interface Enable
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0           1          no          no            Base
  Enabled by interface config, including secondary ip addresses
   Transmit Delay is 1 sec, State DROTHER, Priority 1
   Designated Router (ID) 4.4.4.4, Interface address 10.1.1.4
   Backup Designated router (ID) 3.3.3.3, Interface address 10.1.1.3
   Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
     oob-resync timeout 40
     Hello due in 00:00:00
   Supports Link-local Signaling (LLS)
   Cisco NSF helper support enabled
   IETF NSF helper support enabled
   Index 1/1/1, flood queue length 0
   Next 0x0(0)/0x0(0)/0x0(0)
   Last flood scan length is 0, maximum is 1
   Last flood scan time is 0 msec, maximum is 0 msec
   Neighbor Count is 3, Adjacent neighbor count is 2
     Adjacent with neighbor 3.3.3.3  (Backup Designated Router)
     Adjacent with neighbor 4.4.4.4  (Designated Router)
   Suppress hello for 0 neighbor(s)
```

Influencing DR/BDR Election Using OSPF Priority

```
R1# configure terminal
Configuring from terminal, memory, or network [terminal]?
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)# interface g0/0
R1(config-if)# ip ospf priority 99
R1(config-if)# ^Z
R1#
R1# show ip ospf interface g0/0 | include Priority
  Transmit Delay is 1 sec, State DROTHER, Priority 99

R1# show ip ospf neighbor
Neighbor ID     Pri   State           Dead Time   Address         Interface
2.2.2.2           1   2WAY/DROTHER    00:00:36    10.1.1.2        GigabitEthernet0/0
3.3.3.3           1   FULL/BDR        00:00:30    10.1.1.3        GigabitEthernet0/0
4.4.4.4           1   FULL/DR         00:00:37    10.1.1.4        GigabitEthernet0/0

R1# show ip ospf interface brief
Interface    PID   Area            IP Address/Mask    Cost  State Nbrs F/C
Gi0/1        1     0               10.1.11.1/24       1     DR    0/0
Gi0/0        1     0               10.1.1.1/24        1     DROTH 2/3
```

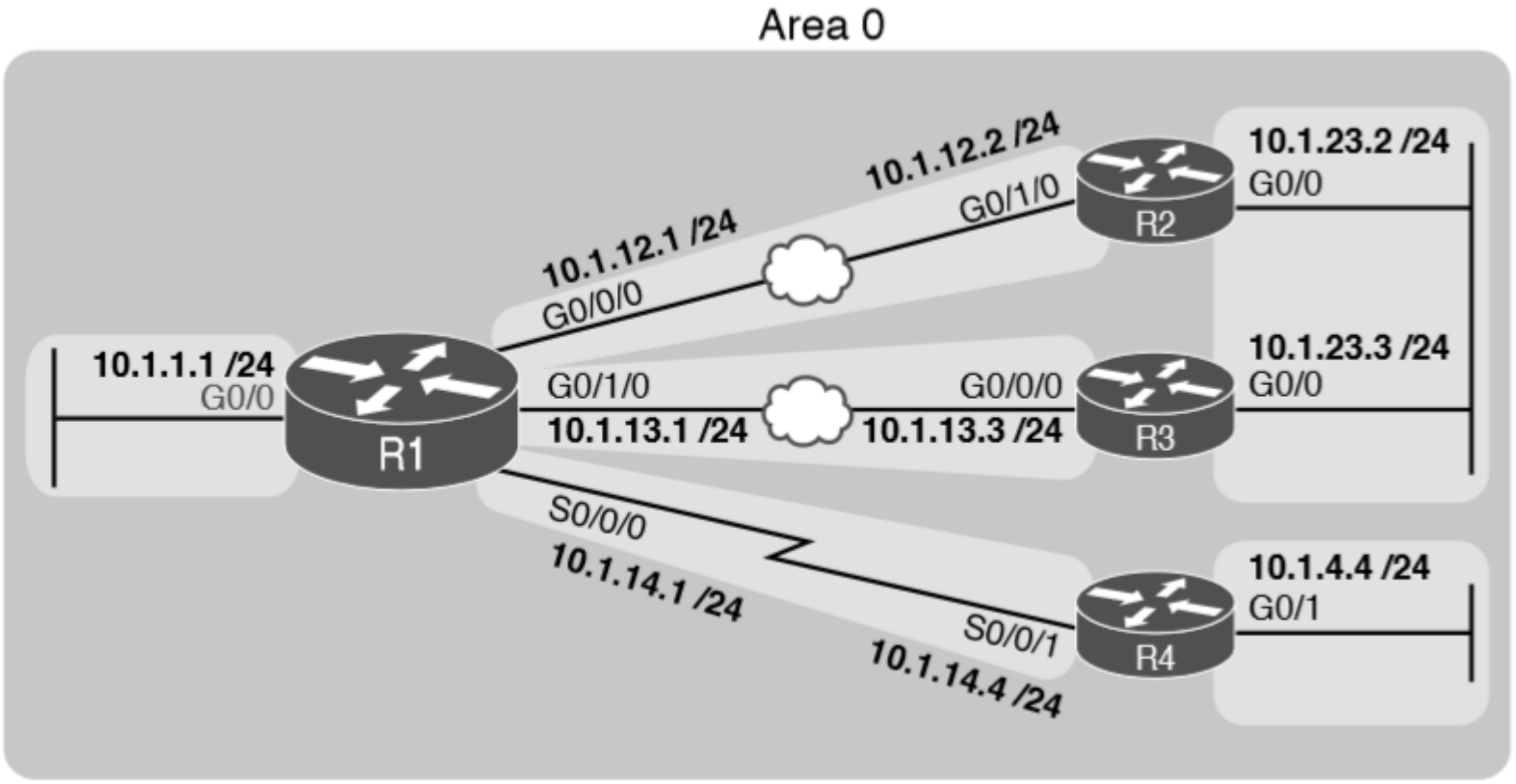
Results of a Completely New DR/BDR Election

```
! Not shown: LAN fails, and then recovers, causing a new OSPF Election
R1# show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
2.2.2.2           1   FULL/DROTHER    00:00:37    10.1.1.2        GigabitEthernet0/0
3.3.3.3           1   FULL/DROTHER    00:00:38    10.1.1.3        GigabitEthernet0/0
4.4.4.4           1   FULL/BDR        00:00:38    10.1.1.4        GigabitEthernet0/0

R1# show ip ospf interface brief
Interface    PID   Area            IP Address/Mask    Cost  State Nbrs F/C
Gi0/1        1     0               10.1.11.1/24       1     DR    0/0
Gi0/0        1     0               10.1.1.1/24        1     DR    3/3
```

Sample OSPF Design with Serial and Ethernet WAN



OSPF Network Type Point-to-Point on an Ethernet WAN Interface on R1

```
R1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)# interface g0/0/0
R1(config-if)# ip ospf network point-to-point
R1(config-if)#

R1# show ip ospf interface g0/0/0
GigabitEthernet0/0/0 is up, line protocol is up
  Internet Address 10.1.12.1/24, Area 0, Attached via Interface Enable
  Process ID 1, Router ID 1.1.1.1, Network Type POINT_TO_POINT, Cost: 1
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0           4         no          no            Base
  Enabled by interface config, including secondary ip addresses
  Transmit Delay is 1 sec, State POINT_TO_POINT
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:01
  Supports Link-local Signaling (LLS)
  Cisco NSF helper support enabled
  IETF NSF helper support enabled
  Index 1/3/3, flood queue length 0
  Next 0x0(0)/0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 3
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 2.2.2.2
  Suppress hello for 0 neighbor(s)
```

OSPF Network Type Point-to-Point on an Ethernet WAN Interface on R1

```
R1# show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
2.2.2.2           0   FULL/  -        00:00:39    10.1.12.2       GigabitEthernet0/0/0
! lines omitted for brevity

R1# show ip ospf interface brief
Interface    PID   Area            IP Address/Mask    Cost  State Nbrs F/C
Gi0/0/0      1     0               10.1.12.1/24       4     P2P   1/1
! lines omitted for brevity
```

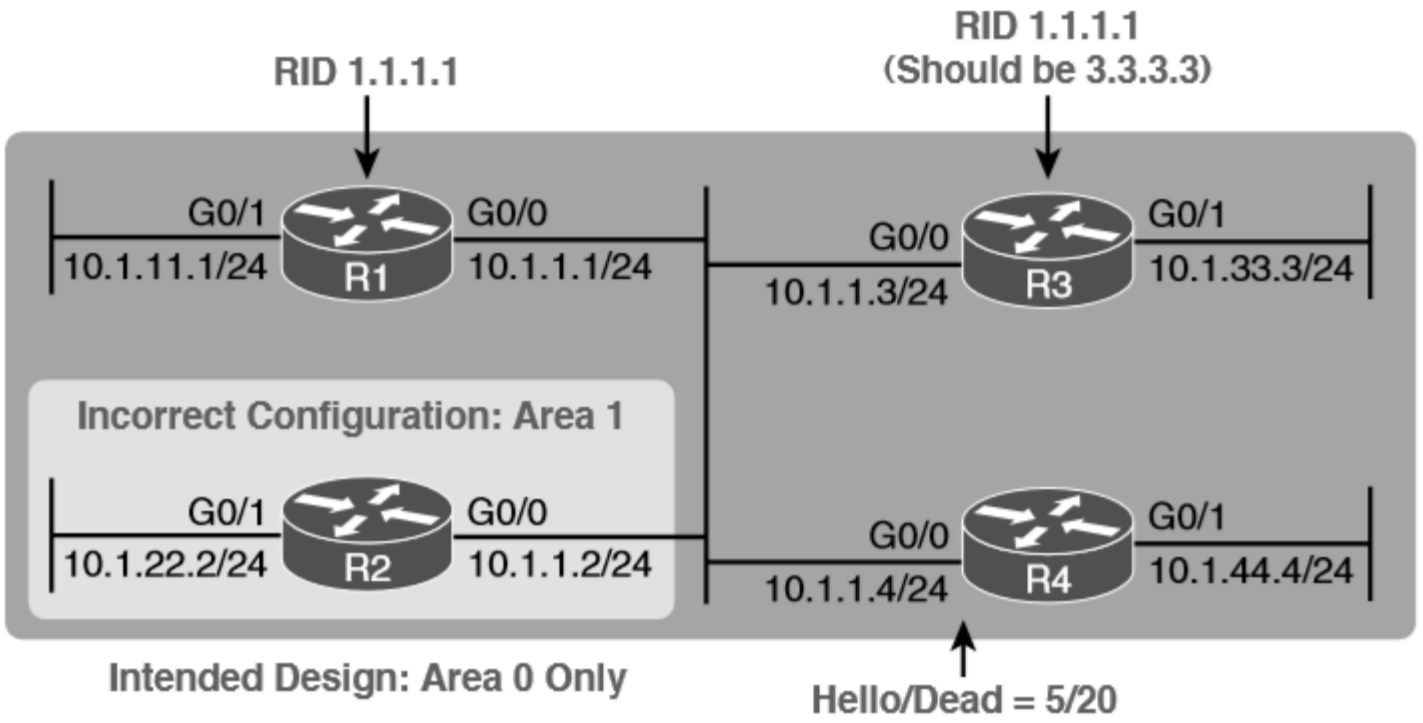
Neighbor Requirements for OSPF

Requirement	Required for OSPF	Neighbor Missing if Incorrect
Interfaces must be in an up/up state.	Yes	Yes
Access control lists (ACL) must not filter routing protocol messages.	Yes	Yes
Interfaces must be in the same subnet.	Yes	Yes
They must pass routing protocol neighbor authentication (if configured).	Yes	Yes
Hello and hold/dead timers must match.	Yes	Yes
Router IDs (RID) must be unique.	Yes	Yes
They must be in the same area.	Yes	Yes
OSPF process must not be shut down.	Yes	Yes
Neighboring interfaces must use same MTU setting.	Yes	No
Neighboring interfaces must use same OSPF network type.	Yes	No

OSPF Neighbor Requirements and the Best show/debug Commands

Requirement	Best show Command
Hello and dead timers must match.	show ip ospf interface
They must be in the same area.	show ip ospf interface brief
RIDs must be unique.	show ip ospf
They must pass any neighbor authentication.	show ip ospf interface
OSPF process must not be shut down.	show ip ospf, show ip ospf interface

Problems That Prevent OSPF Neighbors on the Central LAN



Setting Area 1 on R2's Interfaces, When They Should Be in Area 0

```
router ospf 1
 router-id 2.2.2.2
!
interface gigabitEthernet0/0
 ip ospf 1 area 1
!
interface gigabitEthernet0/1
 ip ospf 1 area 1
```

Comparing OSPF Router IDs on R1 and R3

```
! Next, on R3: R3 lists the RID of 1.1.1.1
!
R3# show ip ospf
Routing Process "ospf 1" with ID 1.1.1.1
Start time: 00:00:37.136, Time elapsed: 02:20:37.200
! lines omitted for brevity
```

```
! Back to R1: R1 also uses RID 1.1.1.1
R1# show ip ospf
Routing Process "ospf 1" with ID 1.1.1.1

Start time: 00:01:51.864, Time elapsed: 12:13:50.904
! lines omitted for brevity

*May 29 00:01:25.679: %OSPF-4-DUP_RTRID_NBR: OSPF detected duplicate router-id
1.1.1.1 from 10.1.1.3 on interface GigabitEthernet0/0
```

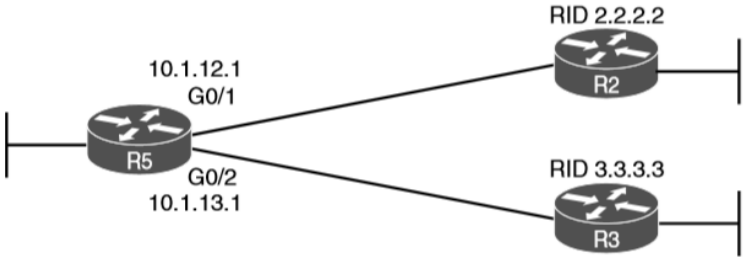
Finding Mismatched Hello/Dead Timers

```
R1# show ip ospf interface G0/0
GigabitEthernet0/0 is up, line protocol is up
  Internet Address 10.1.1.1/24, Area 0, Attached via Network Statement
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Topology-MTID  Cost  Disabled  Shutdown   Topology Name
        0         1       no        no         Base
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 10.1.1.1
  No backup designated router on this network

  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
! lines omitted for brevity
```

```
! Moving on to R4 next
!
R4# show ip ospf interface G10/0
GigabitEthernet0/0 is up, line protocol is up
   Internet Address 10.1.1.4/24, Area 0, Attached via Network Statement
   Process ID 4, Router ID 10.1.44.4, Network Type BROADCAST, Cost: 1
  Topology-MTID  Cost  Disabled  Shutdown   Topology Name
        0         1       no        no         Base
  Transmit Delay is 1 sec, State DR, Priority 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 10.1.44.4, Interface address 10.1.1.4
  No backup designated router on this network
  Timer intervals configured, Hello 5, Dead 20, Wait 20, Retransmit 5
! lines omitted for brevity
```

OSPF Process Shutdown




```
R5# show ip ospf neighbor
Neighbor ID     Pri   State           Dead Time    Address         Interface
2.2.2.2           1   FULL/DR         00:00:35     10.1.12.2       GigabitEthernet0/1
3.3.3.3           1   FULL/DR         00:00:33     10.1.13.3       GigabitEthernet0/2
R5# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R5(config)# router ospf 1
R5(config-router)# shutdown
R5(config-router)# ^Z
*Mar 23 12:43:30.634: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on GigabitEthernet0/1
  from FULL to DOWN, Neighbor Down: Interface down or detached
*Mar 23 12:43:30.635: %OSPF-5-ADJCHG: Process 1, Nbr 3.3.3.3 on GigabitEthernet0/2
  from FULL to DOWN, Neighbor Down: Interface down or detached
R5# show ip ospf interface brief
Interface    PID     Area            IP Address/Mask    Cost  State Nbrs F/C
Gi0/1        1       0               10.1.12.1/24       1     DOWN  0/0
Gi0/2        1       0               10.1.13.1/24       1     DOWN  0/0

R5# show ip ospf
 Routing Process "ospf 1" with ID 5.5.5.5
 Start time: 5d23h, Time elapsed: 1d04h
 Routing Process is shutdown
! lines omitted for brevity

R5# show ip ospf neighbor
R5#
R5# show ip ospf database
            OSPF Router with ID (3.3.3.3) (Process ID 1)
R5#
```

Shutting Down an OSPF Process, and the Resulting Neighbor States

```
*Apr 10 16:31:01.951: %OSPF-4-NET_TYPE_MISMATCH: Received Hello from 2.2.2.2 on
  GigabitEthernet0/0/0 indicating a potential network type mismatch
R1# show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
2.2.2.2           0   FULL/  -        00:00:38    10.1.12.2       GigabitEthernet0/0/0
R1#
```

```
R2# show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
1.1.1.1           1   FULL/BDR        00:00:30    10.1.12.1       GigabitEthernet0/1/0
```