Troubleshoot Open Shortest Path First Route Database Issues

Contents

Introduction

This document describes how to repair a problem with OSPF when routes in the database are not in the Routing Information Base (RIB) or routing table.

Prerequisites

Requirements

Readers of this document must have knowledge of these topics:

- Basic knowledge of Open Shortest Path First (OSPF) protocol
- Basic knowledge of OSPF configuration in Cisco IOS®

Components Used

The information in this document is based on these software and hardware versions:

- Cisco IOS Software Release 12 and later
- This is supported on all Cisco router platforms

The information in this document was created from the devices in a specific lab environment. All of the

devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Conventions

For more information on document conventions, see the Cisco Technical Tips Conventions.

Background Information

This document describes a common problem with Open Shortest Path First (OSPF) in which the routes that are in the database do not appear in the Routing Information Base (RIB) or routing table. In most cases OSPF finds a discrepancy in the database so it does not install the route in the routing table. Often, you can see the `Adv Router is not-reachable` message (which means the router that advertises the LSA is not reachable through OSPF) on top of the link-state advertisement (LSA) in the database when this problem occurs. Here is an example:

<#root>

Router#

show ip ospf database router 172.16.32.2

Adv Router is not-reachable

LS age: 418
Options: (No TOS-capability, DC)
LS Type: Router Links
Link State ID: 172.16.32.2

Advertising Router: 172.16.32.2

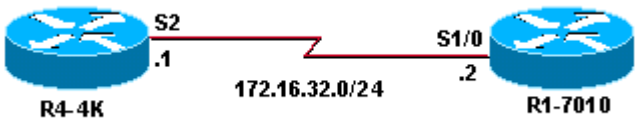
```
LS Seq Number: 80000002
Checksum: 0xFA63
Length: 60
 Number of Links: 3
```

There are several reasons for this problem, most of which deal with misconfiguration or a broken topology. When the configuration is corrected the OSPF database discrepancy goes away and the routes appear in the routing table. This document explains some of the more common reasons that can cause the discrepancy in the database.

Some of the commands used throughout this document for verification of OSPF behavior include the **show ip ospf interface, show ip ospf database router, show ip ospf neighbor** and the **show ip ospf database external** . If you have the output of any of these commands from your Cisco device, you can use Cisco CLI Analyzer to display potential issues and fixes.

Reason 1: Network Type Mismatch

The next network diagram is used as an example:



R4-4K	R1-7010
<#root> interface Loopback0 ip address 172.16.33.1 255.255.255.255 ! interface Serial2 ip address 172.16.32.1 255.255.255.0 **ip ospf network broadcast** ! router ospf 20 network 172.16.0.0 0.0.255.255 area 0	interface Loopback0 ip address 172.16.30.1 255.255.255.255 ! interface Serial1/0 ip address 172.16.32.2 255.255.255.0 clockrate 64000 ! router ospf 20 network 172.16.0.0 0.0.255.255 area 0

<#root>

```
R4-4K(4)#
```

show ip ospf interface serial 2

```
Serial2 is up, line protocol is up
  Internet Address 172.16.32.1/24, Area 0
  Process ID 20, Router ID 172.16.33.1,
```

Network Type BROADCAST

```
, Cost: 64
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 172.16.33.1, Interface address 172.16.32.1
  Backup Designated router (ID) 172.16.32.2, Interface address 172.16.32.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:08
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 172.16.32.2  (Backup Designated Router)
  Suppress hello for 0 neighbor(s)

R1-7010(5)#
```

show ip ospf interface serial 1/0

```
Serial1/0 is up, line protocol is up
  Internet Address 172.16.32.2/24, Area 0
  Process ID 20, Router ID 172.16.32.2,
```

Network Type POINT_TO_POINT

```
, Cost: 64
  Transmit Delay is 1 sec, State POINT_TO_POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
```

```
    Hello due in 00:00:02
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 172.16.33.1
  Suppress hello for 0 neighbor(s)
```

As you can see in the previous output, Router R4-4K is configured for broadcast, and Router R1-7010 is configured for point-to-point. This kind of network type mismatch makes the advertising router unreachable.

<#root>

R4-4K(4)#

show ip ospf database router 172.16.32.2

Adv Router is not-reachable

```
  LS age: 418
  Options: (No TOS-capability, DC)
  LS Type: Router Links
  Link State ID: 172.16.32.2
```

Advertising Router

```
: 172.16.32.2
  LS Seq Number: 80000002
  Checksum: 0xFA63
  Length: 60
   Number of Links: 3
```

Link connected to: another Router (point-to-point)

```
    (Link ID) Neighboring Router ID: 172.16.33.1
    (Link Data) Router Interface address: 172.16.32.2
    Number of TOS metrics: 0
    TOS 0 Metrics: 64

    Link connected to: a Stub Network
    (Link ID) Network/subnet number: 172.16.32.0
    (Link Data) Network Mask: 255.255.255.0
    Number of TOS metrics: 0
    TOS 0 Metrics: 64
```

R1-7010(5)#

show ip ospf database router 172.16.33.1

Adv Router is not-reachable

```
  LS age: 357
  Options: (No TOS-capability, DC)
  LS Type: Router Links
  Link State ID: 172.16.33.1
```

Advertising Router: 172.16.33.1

```
  LS Seq Number: 8000000A
  Checksum: 0xD4AA
  Length: 48
   Number of Links: 2


     Link connected to: a Transit Network

     (Link ID) Designated Router address: 172.16.32.1
     (Link Data) Router Interface address: 172.16.32.1
     Number of TOS metrics: 0
     TOS 0 Metrics: 64
```

You can see that for subnet 172.16.32.0/24, Router R1-7010 generates a point-to-point link and Router R4-4K generates a transit link. This creates a discrepancy in the link-state database, which means no routes are installed in the routing table.

```
<#root>

R1-7010(5)#

show ip route

172.16.0.0/16 is variably subnetted, 3 subnets, 2 masks
C       172.16.32.0/24 is directly connected, Serial1/0
C       172.16.30.1/32 is directly connected, Loopback0
```

Solution

To solve this problem, configure both routers for the same network type. You can either change the network type of Router R1-7010 to broadcast, or change Router R4-4K serial interface to point-to-point.

> **Note**: If you have a situation where one side is a multipoint interface and the other side is a sub-interface then change the network type to broadcast on both sides.

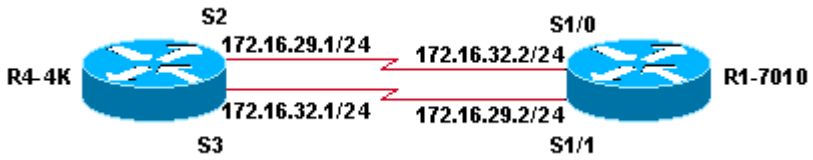
In this example we have removed the network-type broadcast statement on R4-4K because both sides are point-to-point High-Level Data Link Control (HDLC) encapsulated interfaces.

```
<#root>

R4-4K(4)#

configure terminal


R4-4K(4)(config)#

interface serial 2

R4-4K(4)(config-if)#

no ip ospf network broadcast

R4-4K(4)(config-if)#
```

```
end


R4-4K(4)#
show ip ospf interface serial 2

 Serial2 is up, line protocol is up
  Internet Address 172.16.32.1/24, Area 0
  Process ID 20, Router ID 172.16.33.1,
Network Type POINT_TO_POINT
, Cost: 64
  Transmit Delay is 1 sec, State POINT_TO_POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
   Hello due in 00:00:04
  Neighbor Count is 1, Adjacent neighbor count is 1
  Adjacent with neighbor 172.16.32.2
  Suppress hello for 0 neighbor(s)
```

Reason 2: Wrong Address Assignment in Dual Serial Link Setup

Consider this network diagram as an example:



R4-4K	R1-7010
interface loopback 0 ip address 172.16.35.1 255.255.255.255 ! interface Serial2 ip address 172.16.29.1 255.255.255.0 ! interface Serial3 ip address 172.16.32.1 255.255.255.0 ! router ospf 20 network 172.16.0.0 0.0.255.255 area 0	interface loopback 0 ip address 172.16.30.1 255.255.255.255 ! interface Serial1/0 ip address 172.16.32.2 255.255.255.0 clockrate 64000 ! interface Serial1/1 ip address 172.16.29.2 255.255.255.0 clockrate 38400 ! router ospf 20 network 172.16.0.0 0.0.255.255 area 0

You can see that the IP addresses are flipped in the previous configurations, which causes a discrepancy in the OSPF database. However, the routers still form neighbors in Cisco IOS version earlier than 12.1 because on a point-to-point link, OSPF routers do not verify that the neighboring router is on the same subnet.

```
<#root>

R4-4K(4)#

show ip ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
172.16.32.2       1   FULL/  -        00:00:37    172.16.32.2     Serial2
172.16.32.2       1   FULL/  -        00:00:31    172.16.29.2     Serial3
```

From the previous output, you can see that Serial2 is used to form neighbors with IP address 172.16.32.2, which is not in the same subnet. Although neighbors are formed, no routes are installed in the routing table:

```
<#root>

R1-7010(5)#

show ip route

172.16.0.0/16 is variably subnetted, 3 subnets, 2 masks
C       172.16.32.0/24 is directly connected, Serial1/0
C       172.16.29.0/24 is directly connected, Serial1/1
C       172.16.30.1/32 is directly connected, Loopback0
```

Solution

To solve this problem, either correctly assign the IP addresses or switch the serial cables. Here we have corrected the IP addresses:

R4-4K	**R1-7010**
interface loopback 0 ip address 172.16.35.1 255.255.255.255 ! interface Serial2 ip address 172.16.32.1 255.255.255.0 ! interface Serial3 ip address 172.16.29.1 255.255.255.0 ! router ospf 20 network 172.16.0.0 0.0.255.255 area 0	interface loopback 0 ip address 172.16.30.1 255.255.255.255 ! interface Serial1/0 ip address 172.16.32.2 255.255.255.0 clockrate 64000 ! interface Serial1/1 ip address 172.16.29.2 255.255.255.0 clockrate 38400 ! router ospf 20 network 172.16.0.0 0.0.255.255 area 0

```
<#root>

R4-4K(4)#

show ip ospf neighbor
```

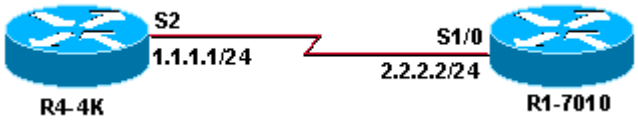
```
Neighbor ID     Pri   State           Dead Time   Address         Interface
172.16.32.2       1   FULL/  -        00:00:36    172.16.32.2     Serial2
172.16.32.2       1   FULL/  -        00:00:39    172.16.29.2     Serial3
```

Now it shows the correct neighbor address on the Serial 2 interface. The routes are also in the routing table:

```
<#root>

R1-7010(5)#

show ip route

172.16.0.0/16 is variably subnetted, 4 subnets, 2 masks
C       172.16.32.0/24 is directly connected, Serial1/0

O       172.16.35.1/32 [110/65] via 172.16.32.1, 00:03:12, Serial1/0


[110/65] via 172.16.29.1, 00:03:12, Serial1/1

C       172.16.29.0/24 is directly connected, Serial1/1
C       172.16.30.1/32 is directly connected, Loopback0
```

Reason 3: One Side of Point-to-Point Link Included in Wrong Majornet or Subnet

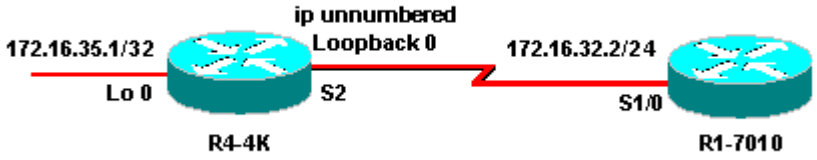
Consider this network diagram as an example:



This situation creates exactly the same behavior as the Wrong Address Assignment in Dual Serial Link Setup. To solve the problem, assign IP addresses in the same subnet on both routers.

Reason 4: One Side Is Unnumbered and the Other Side Is Numbered

Consider the next network diagram as an example:



R4-4K	R1-7010

<#root> interface Loopback0 ip address 172.16.35.1 255.255.255.255 ! interface Serial2 **ip unnumbered Loopback0** router ospf 20 network 172.16.0.0 0.0.255.255 area 0	interface Loopback0 ip address 172.16.30.1 255.255.255.255 ! interface Serial1/0 ip address 172.16.32.2 255.255.255.0 clockrate 64000 ! router ospf 20 network 172.16.0.0 0.0.255.255 area 0

<#root>

R4-4K(4)#

show interface serial 2

Serial2 is up, line protocol is up
  Hardware is cxBus Serial

Interface is unnumbered. Using address of Loopback0

 (172.16.35.1)

R1-7010(5)#

show interface serial 1/0

Serial1/0 is up, line protocol is up
  Hardware is cxBus Serial

Internet address is 172.16.32.2/24

The previous output shows that R4-4K Serial 2 interface is unnumbered to Loopback0 (use address of Loopback0 172.16.35.1), whereas R1-7010's Serial 1/0 is a numbered interface.

<#root>

R4-4K(4)#

show ip ospf interface serial 2

Serial2 is up, line protocol is up
  Internet Address

0.0.0.0/24

, Area 0
  Process ID 20, Router ID 172.16.35.1,

Network Type

 POINT_TO_POINT, Cost: 64
  Transmit Delay is 1 sec, State POINT_TO_POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

```
    Hello due in 00:00:02
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 172.16.32.2
  Suppress hello for 0 neighbor(s)

R1-7010(5)#
```

show ip ospf interface serial 1/0

```
Serial1/0 is up, line protocol is up
  Internet Address 172.16.32.2/24, Area 0
  Process ID 20, Router ID 172.16.32.2,
```

Network Type

```
 POINT_TO_POINT, Cost: 64
  Transmit Delay is 1 sec, State POINT_TO_POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:02
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 172.16.33.1
  Suppress hello for 0 neighbor(s)
```

As you can see previously, the network-type in both cases is point-to-point. The problem is that one side is unnumbered and the other side is not, which creates a discrepancy in the database as shown below.

<#root>

```
R4-4K(4)#
```

show ip ospf database router 172.16.30.1

```
OSPF Router with ID (172.16.35.1) (Process ID 20)
     Router Link States (Area 0)
     LS age: 202
     Options: (No TOS-capability, DC)
     LS Type: Router Links
     Link State ID: 172.16.30.1
     Advertising Router: 172.16.30.1
     LS Seq Number: 80000002
     Checksum: 0xC899
     Length: 60
     Number of Links: 3
 Link connected to: another Router (point-to-point)
     (Link ID) Neighboring Router ID: 172.16.35.1
     (Link Data) Router Interface address: 172.16.32.2
     Number of TOS metrics: 0
     TOS 0 Metrics: 64
 Link connected to: a Stub Network
     (Link ID) Network/subnet number: 172.16.32.0
     (Link Data) Network Mask: 255.255.255.0
     Number of TOS metrics: 0
     TOS 0 Metrics: 64
 Link connected to: a Stub Network
     (Link ID) Network/subnet number: 172.16.30.1
     (Link Data) Network Mask: 255.255.255.255
     Number of TOS metrics: 0
     TOS 0 Metrics: 1
```

```
R1-7010(5)#
```

show ip ospf database router 172.16.35.1

```
OSPF Router with ID (172.16.30.1) (Process ID 20)
     Router Link States (Area 0)
 Adv Router is not-reachable
     LS age: 396
     Options: (No TOS-capability, DC)
     LS Type: Router Links
     Link State ID: 172.16.35.1
     Advertising Router: 172.16.35.1
     LS Seq Number: 80000003
     Checksum: 0xBEA1
     Length: 48
     Number of Links: 2
 Link connected to: another Router (point-to-point)
     (Link ID) Neighboring Router ID: 172.16.30.1
```

(Link Data) Router Interface address: 0.0.0.3

```
!--- In case of an unnumbered link we use MIB-II IfIndex value which usually starts with 0.

     Number of TOS metrics: 0
     TOS 0 Metrics: 64
 Link connected to: a Stub Network
     (Link ID) Network/subnet number: 172.16.35.1
     (Link Data) Network Mask: 255.255.255.255
     Number of TOS metrics: 0
     TOS 0 Metrics: 1

R1-7010(5)#
```

You can see that R1-7010 generates an LSA for this point-to-point link with the Link Data field that contains its interface address, while R4-4K generates the LSA for the same link with the Link Data field that contains the MIB-II IfIndex value (RFC 2328). This creates a discrepancy in the link-state database, which means no routes are installed in the routing table.

<#root>

```
R1-7010(5)#
```

show ip route

```
172.16.0.0/16 is variably subnetted, 3 subnets, 2 masks
C       172.16.32.0/24 is directly connected, Serial1/0
C       172.16.30.1/32 is directly connected, Loopback0
```

Solution

To solve this problem, configure both routers serial interfaces as either numbered or unnumbered. In this example we have numbered the serial 2 interface of router R4-4K.

<#root>

```
R4-4K(4)#
```

configure terminal

```
R4-4K(4)(config)#
```

interface serial 2

```
R4-4K(4)(config-if)#
```

no ip unnumbered loopback 0

```
R4-4K(4)(config-if)#
```

ip address 172.16.32.1 255.255.255.0

```
R4-4K(4))#
```

show ip ospf interface serial 2

```
Serial2 is up, line protocol is up
  Internet Address 172.16.32.1/24, Area 0
  Process ID 20, Router ID 172.16.33.1,
```

Network Type

```
 POINT_TO_POINT, Cost: 64
  Transmit Delay is 1 sec, State POINT_TO_POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:02
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 172.16.32.2
  Suppress hello for 0 neighbor(s)

R1-7010(5)#
```

show ip route

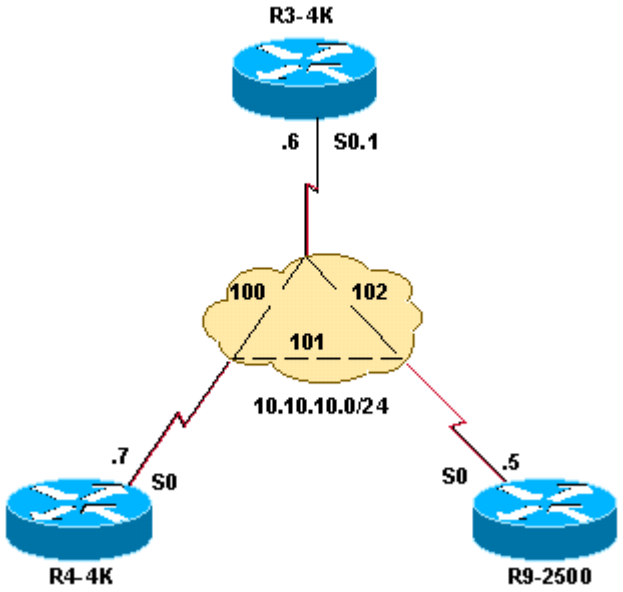
```
172.16.0.0/16 is variably subnetted, 3 subnets, 2 masks
C       172.16.32.0/24 is directly connected, Serial1/0
```

O   172.16.33.1/32 [110/65] via 172.16.32.1, 00:03:08, Serial1/0

```
C       172.16.30.1/32 is directly connected, Loopback0
```

Reason 5: Broken PVC in Fully Meshed Frame Relay Environment

Consider this network diagram as an example:



R9-2500

```
interface Loopback0
 ip address 10.50.50.50 255.255.255.255
 !
interface Serial0
 ip address 10.10.10.5 255.255.255.0
 encapsulation frame-relay
 ip ospf network broadcast
 frame-relay map ip 10.10.10.6 102 broadcast
 frame-relay map ip 10.10.10.7 101 broadcast
!
router ospf 10
 network 10.10.10.0 0.0.0.255 area 0
 network 10.50.50.0 0.0.0.255 area 0
```

R4-4K

```
interface Loopback0
 ip address 10.70.70.70 255.255.255.255
!
interface Serial0
 ip address 10.10.10.7 255.255.255.0
 encapsulation frame-relay
 ip ospf network broadcast
 frame-relay map ip 10.10.10.5 101 broadcast
 frame-relay map ip 10.10.10.6 100 broadcast
!
router ospf 10
 network 10.10.10.0 0.0.0.255 area 0
 network 10.70.70.0 0.0.0.255 area 0
```

R3-4K

```
interface Loopback0
 ip address 10.60.60.60 255.255.255.255
 !
interface Serial0
 no ip address
 encapsulation frame-relay
!
interface Serial0.1 multipoint
 ip address 10.10.10.6 255.255.255.0
 ip ospf network broadcast
 frame-relay map ip 10.10.10.5 102 broadcast
 frame-relay map ip 10.10.10.7 100 broadcast
!
router ospf 10
 network 10.10.10.0 0.0.0.255 area 0
 network 10.60.60.0 0.0.0.255 area 0
```

The broadcast model over Frame Relay works properly as long as the Frame Relay cloud is fully meshed. If any permanent virtual circuits (PVCs) are broken, it can create problems in the OSPF database, which in turn produces the `Adv router not reachable` message.

In this example, the PVC between R9-2500 and R4-4K is broken, and R9-2500 link to the designated router (DR) is broken. As a result, R9-2500 declares all LSAs from R3-4K (which is not a DR), as unreachable. As you can see, R9-2500 does not generates a transit link for the serial interface attached to R3-4K; it generates a stub link instead because as far as R9-2500 is concerned there is no DR on this link.

```
<#root>

R9-2500(3)#

show ip ospf database router


       OSPF Router with ID (10.50.50.50) (Process ID 10)
                Router Link States (Area 0)
  LS age: 148
  Options: (No TOS-capability, DC)
  LS Type: Router Links
  Link State ID: 10.50.50.50
  Advertising Router: 10.50.50.50
  LS Seq Number: 8000000B
  Checksum: 0x55A
  Length: 48
   Number of Links: 2

    Link connected to: a Stub Network
    (Link ID) Network/subnet number: 10.10.10.0
    (Link Data) Network Mask: 255.255.255.0
```

```
    Number of TOS metrics: 0
    TOS 0 Metrics: 64

    Link connected to: a Stub Network
    (Link ID) Network/subnet number: 10.50.50.50
    (Link Data) Network Mask: 255.255.255.255
    Number of TOS metrics: 0
    TOS 0 Metrics: 1
```

Adv Router is not-reachable

```
  LS age: 1081
  Options: (No TOS-capability, DC)
  LS Type: Router Links
  Link State ID: 10.60.60.60
  Advertising Router: 10.60.60.60
  LS Seq Number: 80000006
  Checksum: 0x4F72
  Length: 48
   Number of Links: 2

    Link connected to: a Stub Network
    (Link ID) Network/subnet number: 10.60.60.60
    (Link Data) Network Mask: 255.255.255.255
    Number of TOS metrics: 0
    TOS 0 Metrics: 1

    Link connected to: a Transit Network
    (Link ID) Designated Router address: 10.10.10.7
    (Link Data) Router Interface address: 10.10.10.6
    Number of TOS metrics: 0
    TOS 0 Metrics: 64
```

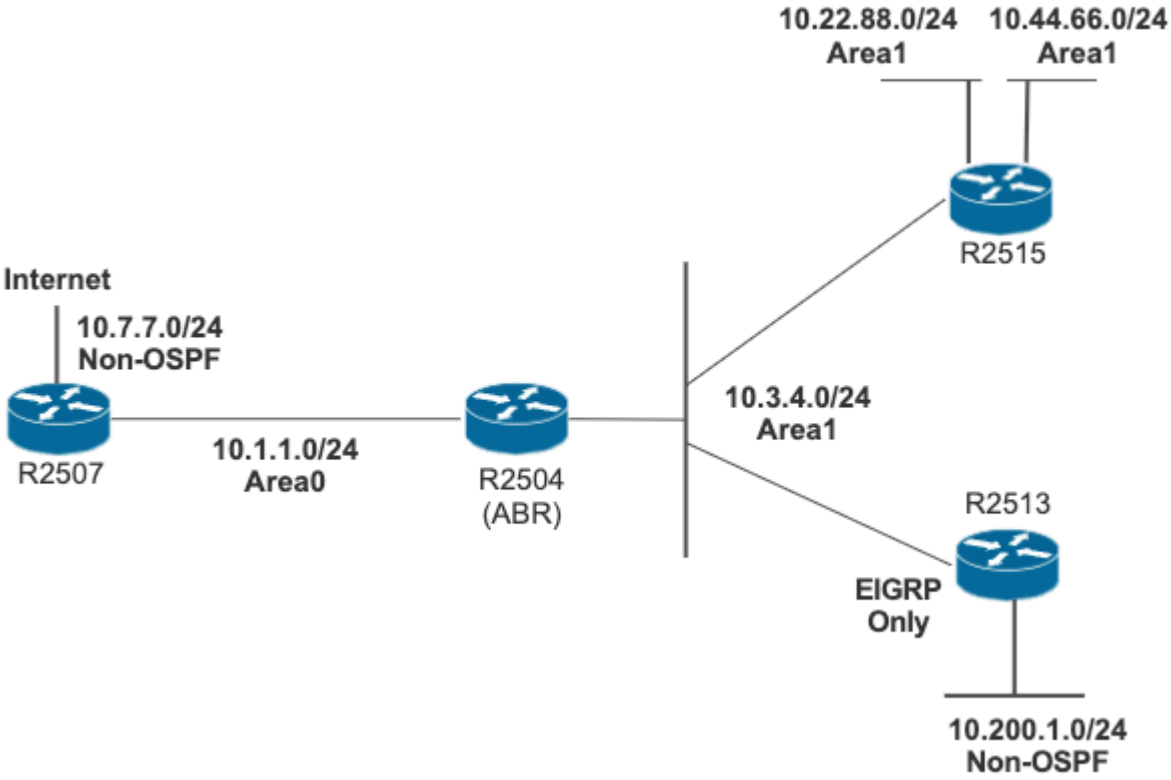
Adv Router is not-reachable

```
  LS age: 306
  Options: (No TOS-capability, DC)
  LS Type: Router Links
  Link State ID: 10.70.70.70
  Advertising Router: 10.70.70.70
  LS Seq Number: 80000007
  Checksum: 0xC185
  Length: 48
   Number of Links: 2

    Link connected to: a Stub Network
    (Link ID) Network/subnet number: 10.70.70.70
    (Link Data) Network Mask: 255.255.255.255
    Number of TOS metrics: 0
    TOS 0 Metrics: 1

    Link connected to: a Transit Network
    (Link ID) Designated Router address: 10.10.10.7
    (Link Data) Router Interface address: 10.10.10.7
    Number of TOS metrics: 0
    TOS 0 Metrics: 64
```

Refer to Problems with OSPF in NBMA and Broadcast Mode over Frame Relay for more detailed information about this problem.

Reason 6: Forwarding Address Known via an External Route

Consider this network diagram as an example:



R2507

```
interface GigabitEthernet0/0
 ip address 10.1.1.1 255.255.255.0
!
interface GigabitEthernet0/1
 ip address 10.7.7.1 255.255.255.0
!
router ospf 1
 network 10.1.1.1 0.0.0.0 area 0
 default-information originate metric 20
!
ip route 0.0.0.0 0.0.0.0 10.7.7.2
```

R2504

```
interface GigabitEthernet0/0
 ip address 10.1.1.2 255.255.255.0
!
interface GigabitEthernet0/1
 ip address 10.3.4.2 255.255.255.0
!
router ospf 1
 network 10.1.1.0 0.0.0.255 area 0
 network 10.0.0.0 0.255.255.255 area 1
 area 1 range 10.0.0.0 255.0.0.0
```

R2515

```
interface GigabitEthernet0/0
 ip address 10.3.4.3 255.255.255.0
!
interface GigabitEthernet0/2
 ip address 10.44.66.3 255.255.255.0
!
interface GigabitEthernet0/3
 ip address 10.22.88.3 255.255.255.0
!
router ospf 1
 redistribute eigrp 1 metric 20 subnets
 network 0.0.0.0 255.255.255.255 area 1
!
router eigrp 1
 network 10.3.4.0 0.0.0.255
```

R2513

```
interface GigabitEthernet0/0
 ip address 10.3.4.4 255.255.255.0
!
interface GigabitEthernet0/1
 ip address 10.200.1.4 255.255.255.0
!
router eigrp 1
 network 10.3.4.0 0.0.0.255
 network 10.200.1.0 0.0.0.255
```

<#root>

R2507#

show ip ospf database external 10.200.1.0

```
            OSPF Router with ID (10.7.7.1) (Process ID 1)

                Type-5 AS External Link States

  LS age: 954
  Options: (No TOS-capability, DC, Upward)
  LS Type: AS External Link
  Link State ID: 10.200.1.0 (External Network Number )
  Advertising Router: 10.44.66.3
  LS Seq Number: 80000007
  Checksum: 0x46EF
  Length: 36
  Network Mask: /24
        Metric Type: 2 (Larger than any link state path)
        MTID: 0
        Metric: 20
        Forward Address:
```

10.3.4.4

```
        External Route Tag: 0
```

R2507 has 10.200.1.0/24 in its database but it has not installed it in the routing table because 10.3.4.4 is learned via an OSPF external route.

<#root>

R2507#

show ip route 10.3.4.4

Routing entry for

10.3.4.0/24

  Known via "ospf 1", distance 110, metric 20,

type extern 2

, forward metric 70
  Redistributing via ospf 1
  Last update from 10.1.1.2 on GigabitEthernet0/0, 00:00:40 ago
  Routing Descriptor Blocks:
  * 10.1.1.2, from 10.44.66.3, 00:00:40 ago, via GigabitEthernet0/0
      Route metric is 20, traffic share count is 1

Note: In this scenario the reason that the Forward Address was learned through an external route is due to the next caveat. With the fix of 'Cisco bug ID CSCdp72526' (registered customers only) , OSPF does not generate a type-5 link-state advertisement (LSA) of an overlapped external network; therefore, R2507 shows only a summary inter-area route of 10.0.0.0/8. Then, R2507 installs 10.200.1.0/24 with a forwarding address and it is reachable via an inter-area route 10.0.0.0/8, thus in compliance with RFC 2328.

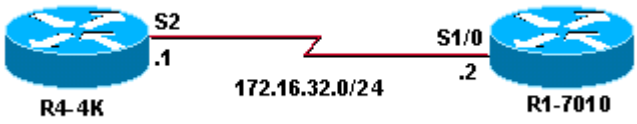
After the fix of the mentioned bug, output looks as follows:

```
<#root>

R2507#

show ip route 10.3.4.4

Routing entry for

10.0.0.0/8

  Known via "ospf 1", distance 110, metric 2,

type inter area

  Last update from 10.1.1.2 on GigabitEthernet0/0, 00:01:02 ago
  Routing Descriptor Blocks:
  * 10.1.1.2, from 10.3.4.2, 00:01:02 ago, via GigabitEthernet0/0
      Route metric is 2, traffic share count is 1

R2507#

show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is 10.7.7.2 to network 0.0.0.0

S*    0.0.0.0/0 [1/0] via 10.7.7.2
      10.0.0.0/8 is variably subnetted, 6 subnets, 3 masks
O IA     10.0.0.0/8 [110/2] via 10.1.1.2, 00:01:41, GigabitEthernet0/0
C        10.1.1.0/24 is directly connected, GigabitEthernet0/0
L        10.1.1.1/32 is directly connected, GigabitEthernet0/0
C        10.7.7.0/24 is directly connected, GigabitEthernet0/1
L        10.7.7.1/32 is directly connected, GigabitEthernet0/1

O E2     10.200.1.0/24 [110/20] via 10.1.1.2, 03:30:47, GigabitEthernet0/0
```

If the forwarding address is also known via an external route, OSPF does not install that route in the routing table. For more detailed information about this problem, see Common Routing Problem with OSPF Forwarding Address.

Reason 7: Routes Blocked by Distribute List

The next network diagram is used as an example:



R4-4K	R1-7010
interface Loopback0 ip address 172.16.33.1 255.255.255.255 ! interface Serial2 ip address 172.16.32.1 255.255.255.0 ! router ospf 20 network 172.16.0.0 0.0.255.255 area 0	interface Loopback0 ip address 172.16.30.1 255.255.255.255 ! interface Serial1/0 ip address 172.16.32.2 255.255.255.0 clockrate 64000 ! router ospf 20 network 172.16.0.0 0.0.255.255 area 0 distribute-list 1 in ! access-list 1 permit 172.16.32.0. 0.0.0.255

As you can see previously, R1-7010 has the **distribute-list** command configured and it only allows the 172.16.32.0/24 address range to be installed in the routing table. In link-state protocols you can not really filter an LSA with the **distribute-list** command. The LSA is still present in the database; however the LSA is not installed in the routing table.

```
<#root>

R1-7010(5)#

show ip ospf database router 172.16.33.1


  LS age: 357
  Options: (No TOS-capability, DC)
  LS Type: Router Links
  Link State ID: 172.16.33.1

  Advertising Router: 172.16.33.1

  LS Seq Number: 8000000A
  Checksum: 0xD4AA
  Length: 48
   Number of Links: 3

 Link connected to: another Router (point-to-point)

    (Link ID) Neighboring Router ID: 172.16.32.2

    (Link Data) Router Interface address: 172.16.32.1
    Number of TOS metrics: 0
    TOS 0 Metrics: 64
```

The **distribute-list** configuration command on R1-7010 filters the 172.16.33.1/32 network and prevents the subnet to be installed in the routing table.

```
<#root>

R1-7010(5)#

show ip route
```

```
172.16.0.0/16 is variably subnetted, 3 subnets, 2 masks
C       172.16.32.0/24 is directly connected, Serial1/0
C       172.16.30.1/32 is directly connected, Loopback0
```

Solution

To solve this problem, configure R1-7010 and allow 172.16.33.0/24 in the access control list (ACL) so this network gets installed in the routing table.

```
<#root>

R1-7010(5)#

configure terminal

R1-7010(5)(config)#

access-list 1 permit 172.16.33.0 0.0.0.255

R1-7010(5)(config)#

end


R1-7010(5)#

show ip access-list 1

Standard IP access list 1
    permit 172.16.32.0, wildcard bits 0.0.0.255

    permit 172.16.33.0, wildcard bits 0.0.0.255


R1-7010(5)#

show ip route

172.16.0.0/16 is variably subnetted, 3 subnets, 2 masks
C       172.16.32.0/24 is directly connected, Serial1/0

O       172.16.33.1/32 [110/65] via 172.16.32.1, 00:00:08, Serial1/0

C       172.16.30.1/32 is directly connected, Loopback0
```

Related Information

- OSPF Support Page
- Cisco Technical Support and Downloads