

排查开放最短路径优先路由数据库问题

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简介

本文档介绍如何在数据库中的路由不在路由信息库 (RIB) 或路由表中时修复 OSPF 问题。

先决条件

要求

本文档的读者必须了解以下主题：

- 开放最短路径优先(OSPF)协议基础知识
- Cisco IOS®中的OSPF配置基础知识。

使用的组件

本文档中的信息基于以下软件和硬件版本：

- Cisco IOS软件版本12及更高版本
- 所有Cisco路由器平台都支持此功能

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您的网络处于活动状态，请确保您了解所有命令的潜在影响。

规则

有关文档规则的详细信息，请参阅 [Cisco 技术提示规则](#)。

背景信息

本文描述开放最短路径优先(OSPF)的一个常见问题，即数据库中的路由不会出现在路由信息库(RIB)或路由表中。在大多数情况下，OSPF会在数据库中找到差异，因此它不会在路由表中安装路由。通常，当出现此问题时，您会在数据库的链路状态通告(LSA)上看到Adv Router is not-reachable消息（这意味着通告LSA的路由器无法通过OSPF到达）。例如：

```
<#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
```

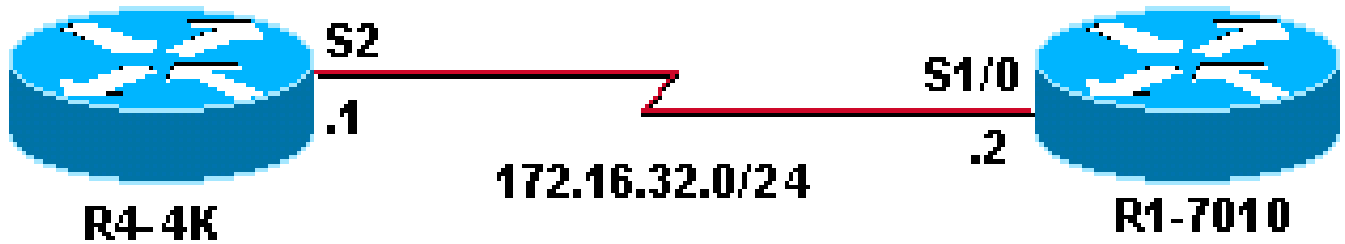
```
Number of Links: 3
```

造成此问题的原因有多种，其中大多数是配置错误或拓扑断开。纠正配置后，OSPF数据库差异消失，路由显示在路由表中。本文档解释导致数据库中出现差异的一些更常见原因。

本文档中用于验证OSPF行为的一些命令包括show ip ospf interface、show ip ospf database router、show ip ospf neighbor和show ip ospf database external。如果从Cisco设备获得上述任何命令的输出，则可以使用[Cisco CLI分析器](#)显示潜在问题和解决方法。

原因1：网络类型不匹配

以下网络图用作示例：



R4-4K	R1-7010
<pre><#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</pre>	<pre>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</pre>

<#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)
```

如前面的输出所示，路由器R4-4K配置为用于广播，路由器R1-7010配置为用于点对点。这种网络类型不匹配导致通告路由器无法访问。

```
<#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
```

您可以看到，对于子网172.16.32.0/24，路由器R1-7010生成一个点对点链路，而路由器R4-4K生成一个传输链路。这会在链路状态数据库中产生差异，这意味着路由表中未安装任何路由。

```
<#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
```

解决方案

要解决此问题，请为同一网络类型配置两台路由器。您可以将路由器R1-7010的网络类型更改为广播，或将路由器R4-4K串行接口更改为点对点。

 注：如果出现一端是多点接口而另一端是子接口的情况，请将网络类型更改为两端广播。

在本例中，我们删除了R4-4K上的network-type broadcast语句，因为两端都是点对点高级数据链路控制(HDLC)封装接口。

```
<#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,

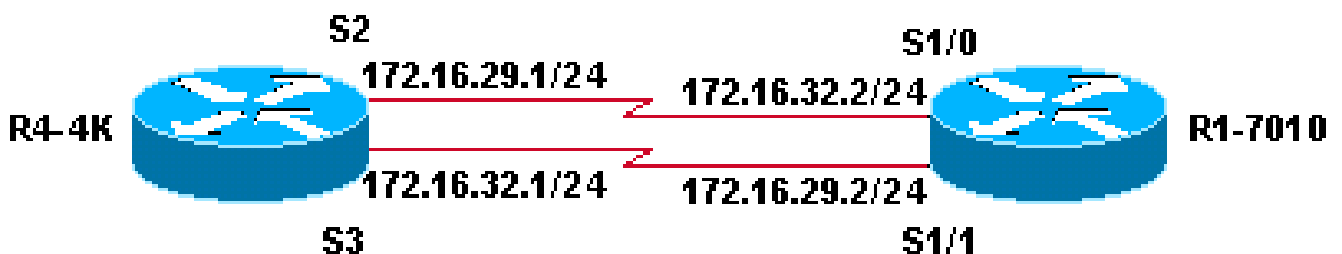
Network Type POINT_TO_POINT

, 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)

```

原因2：双串行链路设置中的地址分配错误

请以以下网络图为例：



R4-4K	R1-7010
<pre> 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 </pre>	<pre> 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 </pre>

--	--

您可以看到IP地址在之前的配置中反转，导致OSPF数据库中存在差异。但是，在Cisco IOS 12.1之前的版本中，路由器仍然形成邻居，因为在点对点链路上，OSPF路由器不会验证相邻路由器是否位于同一子网中。

<#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

从前面的输出中，您可以看到Serial2用于形成IP地址为172.16.32.2的邻居，而此地址不在同一个子网中。虽然形成了邻居，但路由表中未安装任何路由：

<#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
```

解决方案

要解决此问题，请正确分配IP地址或交换串行电缆。此处我们更正了IP地址：

R4-4K	R1-7010
<pre>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</pre>	<pre>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</pre>

--	--

<#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

现在它显示了Serial 2接口的正确邻居地址。路由表也包含这些路由：

<#root>

R1-7010(5)#

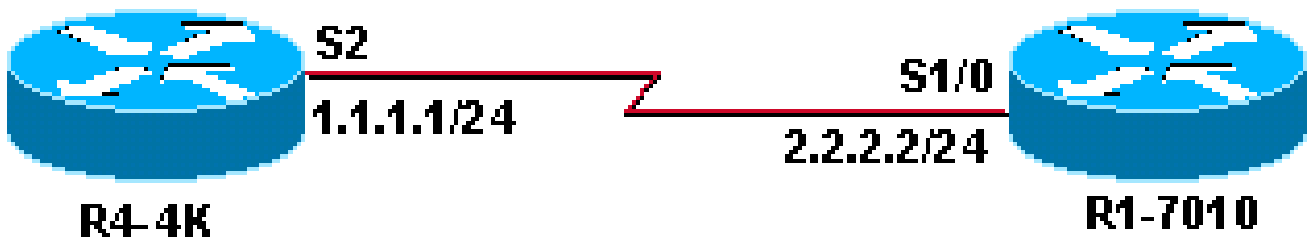
show ip route

```
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
```

原因3：点对点链路的一端包含在错误的主网或子网中

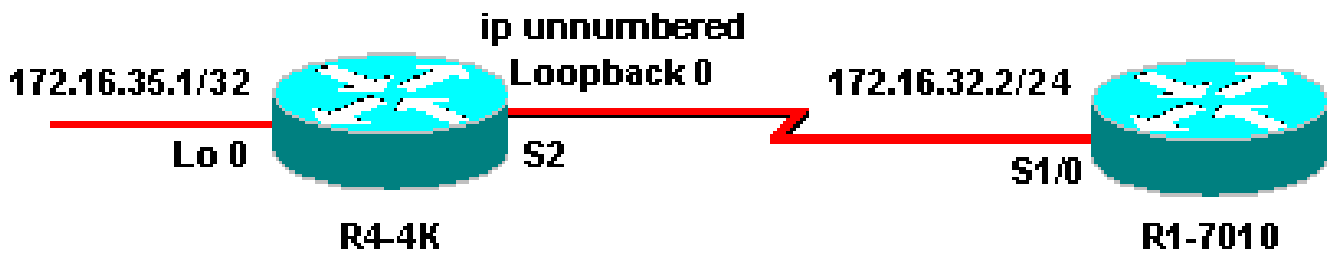
请以以下网络图为例：



此情况产生的行为与双串行链路设置中的[错误地址分配](#)完全相同。要解决此问题，请为两台路由器分配同一子网中的IP地址。

原因4：一端未编号，另一端已编号

以下一个网络图为例：



R4-4K	R1-7010
<pre><#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</pre>	<pre>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</pre>

```
<#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
```

前面的输出显示，R4-4K Serial 2接口未编号为Loopback0（使用Loopback0 172.16.35.1的地址），而R1-7010的Serial 1/0接口为编号接口。

```
<#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)
```

如前所述，两种情况下的network-type都是点对点类型。问题在于一端未编号，而另一端未编号，这样会在数据库中产生差异，如下所示。

```
<#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)#
```

您可以看到，R1-7010使用包含其接口地址的Link Data字段为此点对点链路生成LSA，而R4-4K使用包含MIB-II IfIndex值的Link Data字段为同一链路生成LSA([RFC 2328](#))。这会在链路状态数据库中产生差异，这意味着路由表中未安装任何路由。

```
<#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
```

解决方案

要解决此问题，请将两台路由器的串行接口配置为已编号或未编号。在本例中，我们对路由器R4-4K的串行2接口进行了编号。

```
<#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)
```

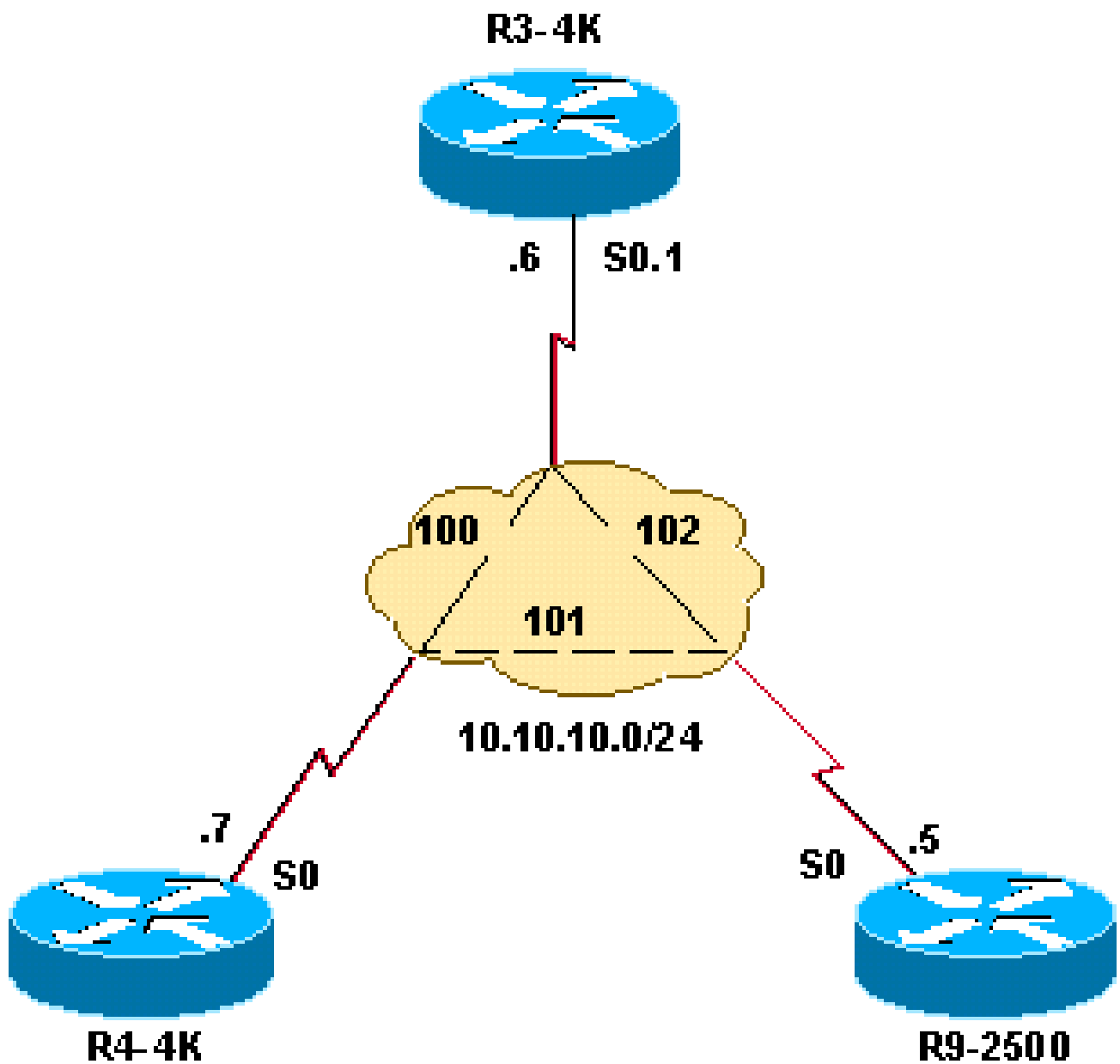
```
R1-7010(5)#
```

```
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
```

原因5：全网状帧中继环境中的PVC断开

请以以下网络图为例：



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
```

只要帧中继网云是全网状的，帧中继上的广播模型就可以正常工作。如果任何永久虚电路(PVC)断开，则会在OSPF数据库中产生问题，进而产生Adv router not reachable消息。

在本示例中，R9-2500和R4-4K之间的PVC断开，R9-2500到指定路由器(DR)的链路也断开。因此，R9-2500声明来自R3-4K（不是DR）的所有LSA不可达。如您所见，R9-2500不会为连接到R3-4K的串行接口生成中转链路；而是生成末节链路，因为对于R9-2500而言，此链路上没有DR。

```
<#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

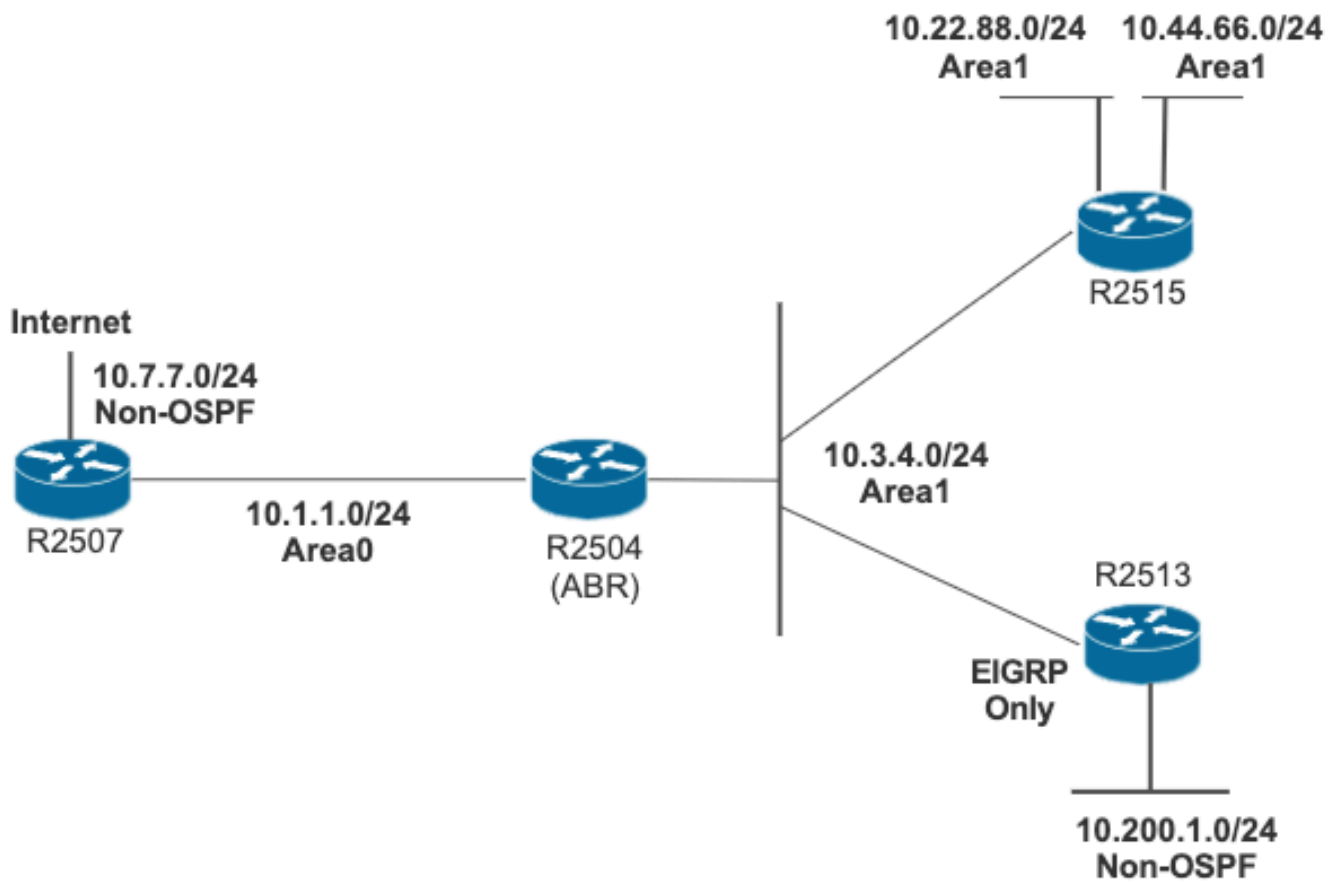
Link connected to: a Stub Network
(Link ID) Network/subnet number: 10.70.70.70
(Link Data) Network Mask: 255.255.255.255
Number of TOS metrics: 0
TOS 0 Metrics: 1

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

有关此问题的详细信息，请参阅[NBMA中的OSPF问题和帧中继上的广播模式](#)。

原因6：转发地址通过外部路由已知

请以以下网络图为例：



```

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的数据库中包含10.200.1.0/24，但它尚未将其添加到路由表中，因为通过OSPF外部路由获知了10.3.4.4。

<#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

 注意：在此场景中，通过外部路由获知转发地址的原因在于下一个警告。通过“Cisco bug ID [CSCdp72526](#)”（仅限注册客户）的修复，OSPF不会生成重叠外部网络的第5类链路状态通告（LSA）；因此，R2507仅显示10.0.0.0/8的区域间总结路由。然后，R2507将带有转发地址的10.200.1.0/24安装到R2507上，它可以通过区域间路由10.0.0.0/8到达，因此符合RFC 2328。

修复了上述Bug后，输出如下所示：

<#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
```

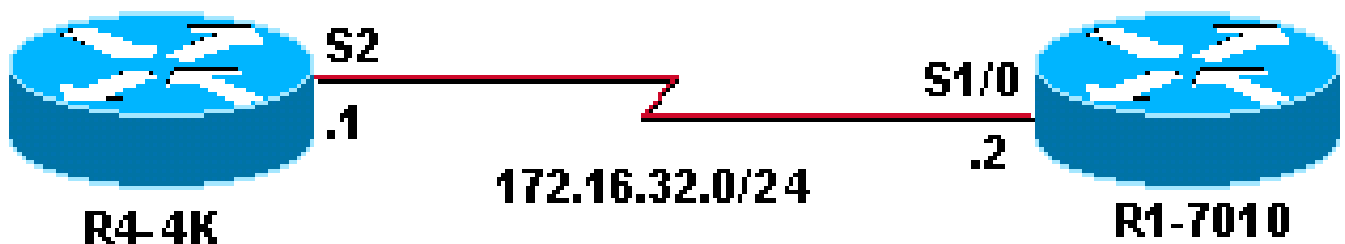
```
L 10.7.7.1/32 is directly connected, GigabitEthernet0/1
```

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

如果转发地址也通过外部路由获知，则OSPF不会将该路由安装到路由表中。有关此问题的更多详细信息，请参阅[OSPF转发地址的常见路由问题](#)。

原因7：分发列表阻止的路由

以下网络图用作示例：



R4-4K	R1-7010
<pre>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</pre>	<pre>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</pre>

如前所述，R1-7010配置了distribute-list命令，它仅允许在路由表中安装172.16.32.0/24地址范围。在链路状态协议中，您实际上无法使用distribute-list命令过滤LSA。LSA仍存在于数据库中；但是LSA未安装在路由表中。

<#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
```

R1-7010上的distribute-list配置命令过滤172.16.33.1/32网络并阻止在路由表中安装子网。

<#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
```

解决方案

要解决此问题，请在访问控制列表(ACL)中配置R1-7010并允许172.16.33.0/24，以便将此网络安装到路由表中。

```
<#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
```

相关信息

- [OSPF 支持页](#)
- [思科技术支持和下载](#)

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