

# 在帧中继的NBMA和广播模式中运行OSPF的问题

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## 简介

本技术说明解释了在全网状帧中继环境中，OSPF路由出现在链路状态数据库中，但不出现在路由表中的问题。有关更多场景，请参阅[为什么有些OSPF路由在数据库中，而不在路由表中？](#)

## 先决条件

### 要求

本文档的读者应掌握以下这些主题的相关知识：

- OSPF
- 帧中继

### 使用的组件

本文档不限于特定的软件和硬件版本。但是，本文档中的配置将通过使用以下软件和硬件版本进行测试和更新：

- Cisco 2500 系列路由器
- Cisco IOS<sup>®</sup>版本12.2(24a)

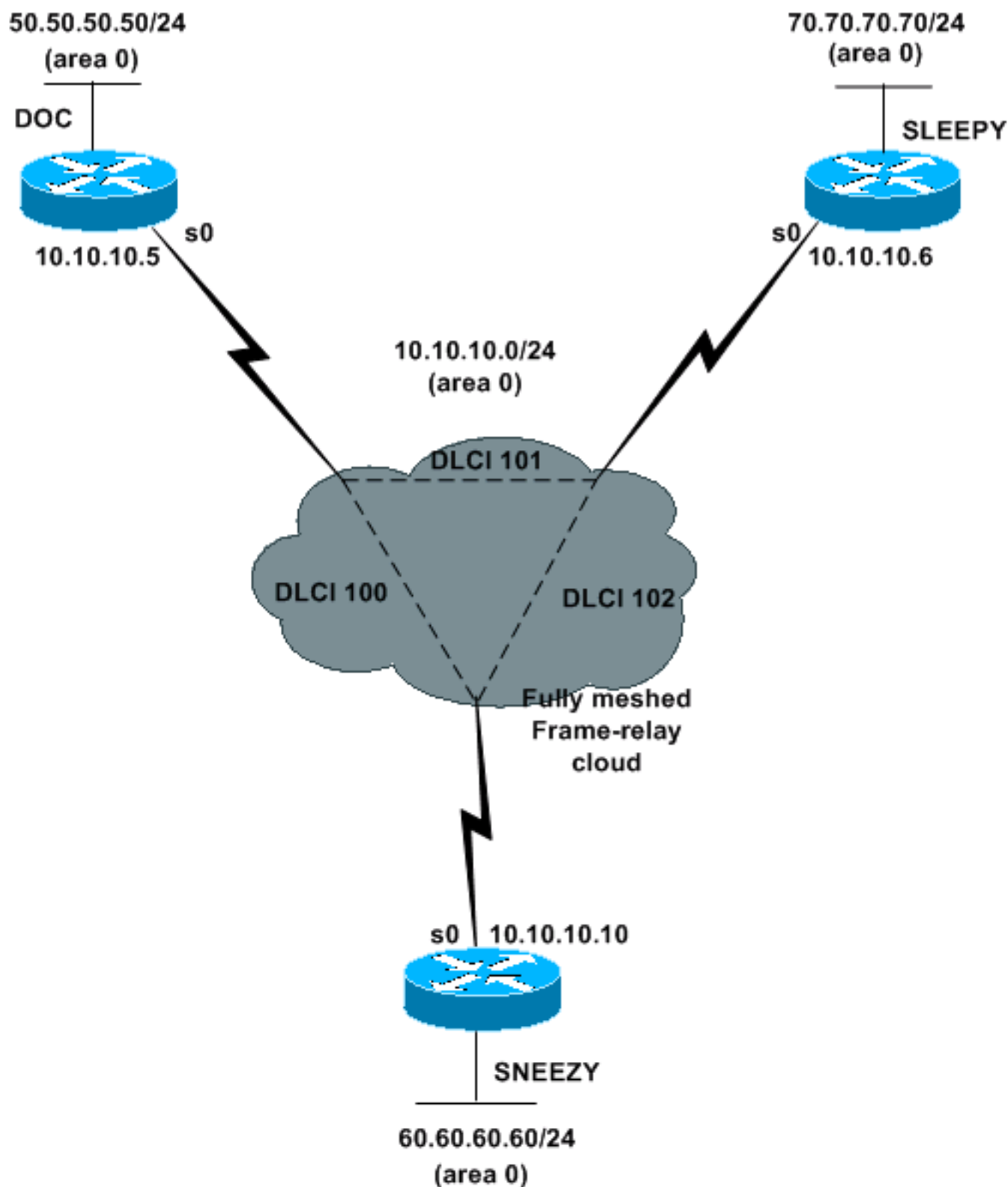
本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

### 规则

有关文件规则的更多信息请参见“Cisco技术提示规则”。

## 背景理论

以下示例使用全网状帧中继环境。网络图和配置如下所示：



### 文档

```
interface Ethernet0
 ip address 50.50.50.50 255.255.255.0

interface Serial0
 encapsulation frame-relay
```

```
!--- Enables Frame Relay encapsulation on the interface.
interface Serial0.1 multipoint !--- The subinterface is
configured as a multipoint link. ip address 10.10.10.5
255.255.255.0 ip ospf network broadcast !--- This
command is used to define the network type as broadcast.
!--- The network type is defined on nonbroadcast
networks to !--- avoid configuring the neighbors
explicitly. frame-relay map ip 10.10.10.6 101 broadcast
frame-relay map ip 10.10.10.10 100 broadcast !--- To
define the mapping between a destination protocol
address !--- and the data-link connection identifier
(DLCI) used to !--- connect to the destination address.
!--- The broadcast keyword is used to forward broadcasts
to !--- this address when broadcast/multicast is !---
disabled because of non-broadcast medium. router ospf 1
network 0.0.0.0 255.255.255.255 area 0
```

## 困

```
interface Ethernet0
  ip address 70.70.70.70 255.255.255.0

interface Serial0
  encapsulation frame-relay
!--- Enables Frame Relay encapsulation on the interface.
interface Serial0.1 multipoint !--- The subinterface is
configured as a multipoint link. ip address 10.10.10.6
255.255.255.0 ip ospf network broadcast !--- This
command is used to define the network type as broadcast.
!--- The network type is defined on nonbroadcast
networks to !--- avoid configuring the neighbors
explicitly. frame-relay map ip 10.10.10.5 101 broadcast
frame-relay map ip 10.10.10.10 102 broadcast !--- To
define the mapping between a destination protocol
address !--- and the DLCI used to connect to the
destination address. !--- The broadcast keyword is used
to forward broadcasts to !--- this address when
broadcast/multicast is !--- disabled because of non-
broadcast medium. router ospf 1 network 0.0.0.0
255.255.255.255 area 0
```

## 斯内齐

```
interface Ethernet0
  ip address 60.60.60.60 255.255.255.0

interface Serial0
  encapsulation frame-relay
!--- Enables Frame Relay encapsulation on the interface.
interface Serial0.1 multipoint !--- The subinterface is
configured as a multipoint link. ip address 10.10.10.10
255.255.255.0 ip ospf network broadcast !--- This
command is used to define the network type as broadcast.
!--- The network type is defined on nonbroadcast
networks to !--- avoid configuring the neighbors
explicitly. frame-relay map ip 10.10.10.5 100 broadcast
frame-relay map ip 10.10.10.6 102 broadcast !--- To
define the mapping between a destination protocol
address !--- and the DLCI used to connect to the
destination address. !--- The broadcast keyword is used
to forward broadcasts to !--- this address when
broadcast/multicast is !--- disabled because of non-
broadcast medium. router ospf 1 network 0.0.0.0
```

```
255.255.255.255 area 0
```

## 问题

最初，所有路由器的邻居表中都包含所有路由。发生事件，导致Doc和Sleepy从各自的邻居表中彼此丢弃。从本部分给定的邻居表中，我们可以看到Doc邻居表没有条目70.70.70.70，而Sleepy邻居表没有条目50.50.50.50。

### 文档邻居表

```
doc#  
show ip ospf neighbor  
  
Neighbor ID Pri State          Dead Time Address  
Interface  
60.60.60.60 1    FULL/DR      00:00:33 10.10.10.10  
Serial0.1
```

### 睡眠邻居表

```
sleepy# show ip ospf neighbor  
  
Neighbor ID Pri State          Dead Time Address  
Interface  
60.60.60.60 1    FULL/BDR     00:00:32 10.10.10.10  
Serial0.1
```

### Sneezy邻居表

```
sneezy# show ip ospf neighbor  
  
Neighbor ID Pri State          Dead Time Address  
Interface  
50.50.50.50 1    FULL/DROTHER 00:00:36 10.10.10.5  
Serial0.1  
70.70.70.70 1    FULL/DR      00:00:31 10.10.10.6  
Serial0.1
```

此外，Doc会丢失其路由表中的所有OSPF路由，Sleepy和Sneezy的路由表中不再有50.50.50.0（Doc的LAN子网）。

### 文档路由表

```
doc#  
show ip route  
Gateway of last resort is not set  
10.0.0.0 255.255.255.0 is subnetted, 1 subnets  
C      10.10.10.0 is directly connected, Serial0.1  
50.0.0.0 255.255.255.0 is subnetted, 1 subnets  
C      50.50.50.0 is directly connected, Ethernet0
```

### 睡眠路由表

```
sleepy# show ip route  
Gateway of last resort is not set  
10.0.0.0/ 24 is subnetted, 1 subnets  
C      10.10.10.0 is directly connected, Serial0.1  
60.0.0.0/ 24 is subnetted, 1 subnets  
O      60.60.60.0 [110/ 11175] via 10.10.10.10, 00:
```

```

07: 25, Serial0.1
    70.0.0.0/ 24 is subnetted, 1 subnets
C    70.70.70.0 is directly connected, Ethernet0

```

### Sneezy路由表

```

sneezy# show ip route
Gateway of last resort is not set
    10.0.0.0/ 24 is subnetted, 1 subnets
C    10.10.10.0 is directly connected, Serial0.1
    60.0.0.0/ 24 is subnetted, 1 subnets
C    60.60.60.0 is directly connected, Ethernet0
    70.0.0.0/ 24 is subnetted, 1 subnets
O    70.70.70.0 [110/ 11175] via 10.10.10.6, 00: 07:
53, Serial0.1

```

尽管Doc的路由表中没有任何OSPF路由，但从下面的输出中我们可以看到它确实有完整的OSPF数据库。

### 文档数据库

```

doc#
show ip ospf database

                    OSPF Router with ID
(50.50.50.50) (Process ID 1)

                    Router Link
States (Area 0)

Link ID          ADV Router    Age      Seq#          Checksum
Link count
50.50.50.50      50.50.50.50   169      0x80000030    0x3599
2
60.60.60.60      60.60.60.60   1754     0x8000002F    0xD26D
2
70.70.70.70      70.70.70.70   1681     0x8000002D    0xFDD9
2

                    Net Link
States (Area 0)

Link ID          ADV Router    Age      Seq#          Checksum
10.10.10.6       70.70.70.70   569      0x8000002B    0x8246

```

网络链路状态是指定路由器(DR)生成的链路状态，用于描述连接到网络的所有路由器。在以下输出中，我们看到DR未将文档路由器ID(50.50.50.50)列为连接的路由器，这会破坏广播模式。因此，Doc不安装通过帧中继网络获知的任何OSPF路由。

### 网络链路状态

```

doc#
show ip ospf database network 10.10.10.6

                    Net Link
States (Area 0)

LS Type: Network Links
Link State ID: 10.10.10.6 (address of Designated
Router)

```

```
Advertising Router: 70.70.70.70

Network Mask: 255.255.255.0
  Attached Router: 70.70.70.70
  Attached Router: 60.60.60.60
```

另一种方法是，Doc声明Sneezy为DR，并期望Sneezy生成网络链路状态。但是，由于Sneezy不是DR，因此它不会生成网络链路状态，这反过来又不允许Doc在其路由表中安装任何路由。

```
文档邻居表

doc# show ip ospf neighbor

Neighbor ID      Pri   State           Dead Time
Address          Interface
60.60.60.60     1    FULL/DR         00:00:29
10.10.10.10     Serial0.1
```

### 原因

根据数据库，帧中继云的DR为Sleepy。但是，Sleepy不将Doc视为OSPF邻居。如本例所示，从Sleepy到Doc的ping失败：

```
sleepy# ping 10.10.10.5

Type escape sequence to abort.
Sending 5, 100- byte ICMP Echos to 10.10.10.5, timeout is 2 seconds:
.....
Success rate is 0 percent (0/ 5)
```

从Sleepy中的show frame-relay map命令的输出中，我们可以看到进入Doc的DLCI处于非活动状态。这就解释了为什么困困者无法ping通多克，也解释了为什么他们不把彼此视为邻居。以下事件触发了问题：

```
sleepy# show frame-relay map
Serial0.1 (up): ip 10.10.10.5 dlci 101( 0x65,0x1850), static,
                broadcast,
                CISCO, status defined, inactive

Serial0.1 (up): ip 10.10.10.10 dlci 102( 0x66,0x1860), static,
                broadcast,
                CISCO, status defined, active
```

由于Doc和Sleepy之间的PVC已断开，并且Doc到指定路由器(DR)的链路已断开，因此Doc声明来自Sneezy (不是DR)的所有LSA都不可达。如果帧中继网云全网状，则帧中继上的广播模型工作正常。如果任何永久虚电路(PVC)损坏，则会在OSPF数据库中造成问题，这从下面显示的show ip ospf database router命令输出中可以明显看出Adv router is not-reachable消息。

```
文档邻居表

doc#
show ip ospf database router
      OSPF Router with ID (50.50.50.50) (Process
ID 1)

      Router Link States (Area 0)
```

LS age: 57  
Options: (No TOS-capability, DC)  
LS Type: Router Links  
Link State ID: 50.50.50.50  
Advertising Router: 50.50.50.50  
LS Seq Number: 800000D4  
Checksum: 0x355D  
Length: 48  
Number of Links: 2

Link connected to: a Transit Network  
(Link ID) Designated Router address: 10.10.10.10  
(Link Data) Router Interface address: 10.10.10.5  
Number of TOS metrics: 0  
TOS 0 Metrics: 64

Link connected to: a Stub Network  
(Link ID) Network/subnet number: 50.50.50.0  
(Link Data) Network Mask: 255.255.255.0  
Number of TOS metrics: 0  
TOS 0 Metrics: 10

**Adv Router is not-reachable**

LS age: 367  
Options: (No TOS-capability, DC)  
LS Type: Router Links  
Link State ID: 60.60.60.60  
Advertising Router: 60.60.60.60  
LS Seq Number: 800000C9  
Checksum: 0xC865  
Length: 48  
Number of Links: 2

Link connected to: a Transit Network  
(Link ID) Designated Router address: 10.10.10.6  
(Link Data) Router Interface address: 10.10.10.10  
Number of TOS metrics: 0  
TOS 0 Metrics: 64

Link connected to: a Stub Network  
(Link ID) Network/subnet number: 60.60.60.0  
(Link Data) Network Mask: 255.255.255.0  
Number of TOS metrics: 0  
TOS 0 Metrics: 10

**Adv Router is not-reachable**

LS age: 53  
Options: (No TOS-capability, DC)  
LS Type: Router Links  
Link State ID: 70.70.70.70  
Advertising Router: 70.70.70.70  
LS Seq Number: 800000CA  
Checksum: 0xEDD4  
Length: 48  
Number of Links: 2

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

```
Link connected to: a Stub Network
(Link ID) Network/subnet number: 70.70.70.0
(Link Data) Network Mask: 255.255.255.0
Number of TOS metrics: 0
TOS 0 Metrics: 10
```

## [解决方案](#)

当您将在支持广播或非广播的多路访问网络上运行时，所有设备必须能够直接（至少）与指定路由器通信。广播和NBMA模型依赖于帧中继网云的全网状。如果永久虚电路(PVC)断开，云将不再全网状，OSPF无法正常工作。

在帧中继环境中，如果第2层不稳定（如我们的示例所示），我们不建议使用OSPF广播网络类型。改为使用OSPF点对多点。

## [相关信息](#)

- [OSPF 故障排除](#)
- [OSPF 设计指南](#)
- [Cisco - 了解 OSPF 邻居问题](#)
- [基于非广播型链路的 OSPF 的初始配置](#)
- [帧中继子接口上的 OSPF 初始配置](#)
- [IP 路由 支持页](#)
- [OSPF 支持页](#)
- [技术支持和文档 - Cisco Systems](#)