

OSPF非末节区域类型7到类型5的连接状态通告转换

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简介

本文显示开放式最短路径优先(OSPF)如何转换非末节区域类型7链路状态广播(LSA)到类型5 LSA。

先决条件

要求

本文档没有任何特定的要求。

使用的组件

本文档不限于特定的软件和硬件版本。

规则

有关文档规则的详细信息，请参阅 [Cisco 技术提示规则](#)。

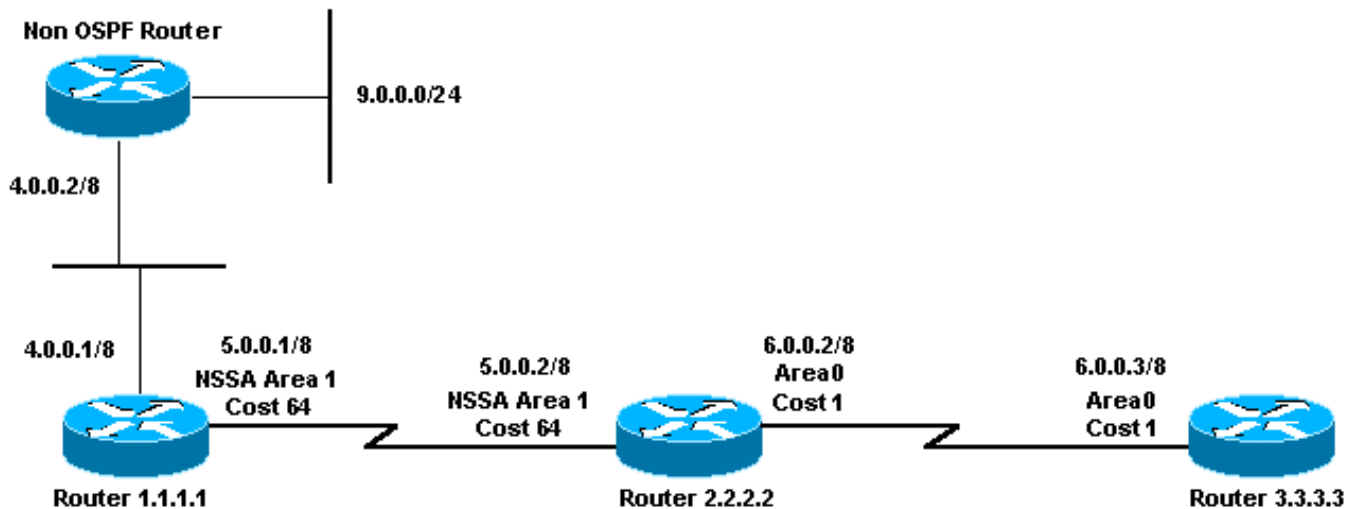
配置

本部分提供有关如何配置本文档所述功能的信息。

注：要查找有关本文档中使用的命令的其他信息，请使用命令[查找工具](#)([仅注册客户](#))。

网络图

本文档使用此图所示的网络设置。



配置

本文档使用此处所示的配置。

- [路由器 1.1.1.1](#)
- [路由器 2.2.2.2](#)
- [路由器 3.3.3.3](#)

路由器 1.1.1.1

Current configuration:

```
hostname r1.1.1.1

interface Loopback0
 ip address 1.1.1.1 255.0.0.0

interface Serial2/1/0
 ip address 5.0.0.1 255.0.0.0

interface Ethernet2/0/0
 ip address 4.0.0.1 255.0.0.0

router ospf 4
 redistribute static metric 5 metric-type 1
 network 5.0.0.0 0.255.255.255 area 1
 network 4.0.0.0 0.255.255.255 area 1
 area 1 nssa

ip route 9.0.0.0 255.0.0.0 4.0.0.2

end
```

路由器 2.2.2.2

Current configuration:

```
hostname r2.2.2.2

interface Loopback0
 ip address 2.2.2.2 255.0.0.0

interface Serial0/1/0
 ip address 5.0.0.2 255.0.0.0

interface ATM1/0.20
 ip address 6.0.0.2 255.0.0.0

router ospf 2
 network 5.0.0.0 0.255.255.255 area 1
 network 6.0.0.0 0.255.255.255 area 0
 area 1 nssa

end
```

路由器 3.3.3.3

```
Current configuration:

hostname r3.3.3.3

interface Loopback0
 ip address 3.3.3.3 255.0.0.0

interface ATM2/0.20 point-to-point
 ip address 6.0.0.3 255.0.0.0

router ospf 2
 network 6.0.0.0 0.255.255.255 area 0

end
```

验证

本部分所提供的信息可用于确认您的配置是否正常工作。

[命令输出解释程序工具（仅限注册用户）支持某些 show 命令](#)，使用此工具可以查看对 show 命令输出的分析。

- [show ip ospf database](#) — 显示LSA的列表并将其键入链路状态数据库。此列表仅显示 LSA 报头中的信息。
- [show ip ospf database nssa-external](#) — 仅显示有关NSSA外部LSA的信息。
- [show ip ospf database external](#) - 仅显示有关外部 LSA 的信息。
- [show ip ospf database \[router\] \[link-state-id\]](#) -显示在数据库中的一台路由器所有的LSA列表。LSA是由每个路由器生产的，并且这些基本LSA列出所有路由器链路或者接口。以及状态和链路流出开销。他们应只在产生的区内被泛洪。
- [show ip ospf database summary <link state id>](#) -显示区域边界路由器(ABR)汇总链路。
- [show ip route](#) - [显示路由表的当前状态。](#)

检查 OSPF 数据库

要查看OSPF数据库在此网络环境中是什么样子的，使用show ip ospf database命令。

```
r2.2.2.2#show ip ospf database
```

```
OSPF Router with ID (2.2.2.2) (Process ID 2)
```

```
Router Link States (Area 0)
```

| Link ID | ADV Router | Age | Seq# | Checksum | Link count |
|---------|------------|------|------------|----------|------------|
| 2.2.2.2 | 2.2.2.2 | 1235 | 0x8000001D | 0xD9FF | 2 |
| 3.3.3.3 | 3.3.3.3 | 1100 | 0x8000000B | 0x9455 | 2 |

```
Summary Net Link States (Area 0)
```

| Link ID | ADV Router | Age | Seq# | Checksum |
|---------|------------|------|------------|----------|
| 4.0.0.0 | 2.2.2.2 | 1979 | 0x80000002 | 0xFDE7 |
| 5.0.0.0 | 2.2.2.2 | 1483 | 0x80000004 | 0x8864 |

```
Router Link States (Area 1)
```

| Link ID | ADV Router | Age | Seq# | Checksum | Link count |
|---------|------------|-----|------------|----------|------------|
| 1.1.1.1 | 1.1.1.1 | 319 | 0x8000000C | 0xAFA8 | 3 |
| 2.2.2.2 | 2.2.2.2 | 220 | 0x8000002F | 0xD478 | 2 |

```
Summary Net Link States (Area 1)
```

| Link ID | ADV Router | Age | Seq# | Checksum |
|---------|------------|------|------------|----------|
| 6.0.0.0 | 2.2.2.2 | 1483 | 0x8000001C | 0x7894 |

```
Type-7 AS External Link States (Area 1)
```

| Link ID | ADV Router | Age | Seq# | Checksum | Tag |
|---------|------------|-----|------------|----------|-----|
| 9.0.0.0 | 1.1.1.1 | 334 | 0x80000005 | 0xD738 | 0 |

```
Type-5 AS External Link States
```

| Link ID | ADV Router | Age | Seq# | Checksum | Tag |
|---------|------------|------|------------|----------|-----|
| 9.0.0.0 | 2.2.2.2 | 1725 | 0x80000004 | 0x50C6 | 0 |

要向NSSA通告外部路由，自治系统边界路由器(ASBR)会创建nssa外部LSA (第7类)。

```
r2.2.2.2#show ip ospf database nssa-external 9.0.0.0
```

```
OSPF Router with ID (2.2.2.2) (Process ID 2)
```

```
Type-7 AS External Link States (Area 1)
```

```
Routing Bit Set on this LSA
```

```
LS age: 381
```

```
Options: (No TOS-capability, Type 7/5 translation, DC)
```

```
!--- This can be translated into a type 5 LSA by !--- an ABR. LS Type: AS External Link Link  
State ID: 9.0.0.0 (External Network Number ) !--- The ASBR (Router 1.1.1.1) advertises !---  
9.0.0.0/8. Advertising Router: 1.1.1.1 !--- Router ID of the ASBR. LS Seq Number: 80000005  
Checksum: 0xD738 Length: 36 Network Mask: /8 Metric Type: 1 (Comparable directly to link state  
metric) TOS: 0 Metric: 5 Forward Address: 4.0.0.1 !--- Forwarding address is incorrectly  
specified !--- as an interface on the ASBR.
```

ABR将第7类LSA转换为第5类LSA，并将第5类LSA传播到正常区域。

```
r2.2.2.2#show ip ospf database external 9.0.0.0
```

```
OSPF Router with ID (2.2.2.2) (Process ID 2)
```

Type-5 AS External Link States

```
LS age: 1782
Options: (No TOS-capability, DC)
LS Type: AS External Link
Link State ID: 9.0.0.0 (External Network Number )
!--- Router 2.2.2.2 advertises 9.0.0.0/8. Advertising Router: 2.2.2.2 !--- When the conversion
is complete, the advertising !--- router ID becomes the ABR router ID !--- because the ABR
originates this type 5 LSA. LS Seq Number: 80000004 Checksum: 0x50C6 Length: 36 Network Mask: /8
Metric Type: 1 (Comparable directly to link state metric) TOS: 0 Metric: 5 Forward Address:
4.0.0.1 External Route Tag: 0 r2.2.2.2#show ip ospf database router 1.1.1.1
```

OSPF Router with ID (2.2.2.2) (Process ID 2)

Router Link States (Area 1)

```
Routing Bit Set on this LSA
LS age: 426
Options: (No TOS-capability, DC)
LS Type: Router Links
Link State ID: 1.1.1.1
!--- For router links, Link State ID is always the same !--- as the advertising router (next
line). Advertising Router: 1.1.1.1 LS Seq Number: 8000000C Checksum: 0xAFA8 Length: 60 AS
Boundary Router !--- Bit E in the router LSA indicates that this router !--- originates from
external LSAs. Number of Links: 3 !--- There are three links in area 1. Link connected to: a
Stub Network !--- This represents the Ethernet segment 4.0.0.0/8. (Link ID) Network/subnet
number: 4.0.0.0 (Link Data) Network Mask: 255.0.0.0 Number of TOS metrics: 0 TOS 0 Metrics: 10
!--- The OSPF cost of the Ethernet segment. Link connected to: another Router (point-to-point)
!--- Shows that Router 1.1.1.1 is a neighbor with !--- Router 2.2.2.2. (Link ID) Neighboring
Router ID: 2.2.2.2 (Link Data) Router Interface address: 5.0.0.1 !--- The interface address that
connects to Router !--- 2.2.2.2 is 5.0.0.1. Number of TOS metrics: 0 TOS 0 Metrics: 64 !--- The
OSPF cost of the link that connects !--- the two routers. Link connected to: a Stub Network !---
This represents the serial link 5.0.0.0/8. (Link ID) Network/subnet number: 5.0.0.0 (Link Data)
Network Mask: 255.0.0.0 Number of TOS metrics: 0 TOS 0 Metrics: 64 !--- The OSPF cost of the
serial link.
```

从此处的粗体输出可以看到，尽管路由器2.2.2.2的配置中没有任何redistribute语句，但它仍是ASBR，因为它将第7类LSA转换为第5类LSA。

```
r2.2.2.2#show ip ospf database router 2.2.2.2
```

OSPF Router with ID (2.2.2.2) (Process ID 2)

Router Link States (Area 0)

```
LS age: 1361
Options: (No TOS-capability, DC)
LS Type: Router Links
Link State ID: 2.2.2.2
Advertising Router: 2.2.2.2
LS Seq Number: 8000001D
Checksum: 0xD9FF
Length: 48
Area Border Router
!--- Bit B is set in the router LSA to indicate !--- that this router is an ABR. AS Boundary
Router
!--- Bit E in the router LSA indicates that this router !--- originates from external LSAs.
Number of Links: 2 !--- There are two links in area 0. Link connected to: another Router (point-
to-point) (Link ID) Neighboring Router ID: 3.3.3.3 (Link Data) Router Interface address: 6.0.0.2
Number of TOS metrics: 0 TOS 0 Metrics: 1 Link connected to: a Stub Network (Link ID)
Network/subnet number: 6.0.0.0 (Link Data) Network Mask: 255.0.0.0 Number of TOS metrics: 0 TOS
0 Metrics: 1 Router Link States (Area 1) LS age: 346 Options: (No TOS-capability, DC) LS Type:
Router Links Link State ID: 2.2.2.2 Advertising Router: 2.2.2.2 LS Seq Number: 8000002F
```

```
Checksum: 0xD478 Length: 48 Area Border Router AS Boundary Router Number of Links: 2 Link
connected to: another Router (point-to-point) (Link ID) Neighboring Router ID: 1.1.1.1 (Link
Data) Router Interface address: 5.0.0.2 Number of TOS metrics: 0 TOS 0 Metrics: 64 Link
connected to: a Stub Network (Link ID) Network/subnet number: 5.0.0.0 (Link Data) Network Mask:
255.0.0.0 Number of TOS metrics: 0 TOS 0 Metrics: 64 r2.2.2.2#show ip ospf database router
3.3.3.3
```

```
OSPF Router with ID (2.2.2.2) (Process ID 2)
```

```
Router Link States (Area 0)
```

```
LS age: 1245
Options: (No TOS-capability, DC)
LS Type: Router Links
Link State ID: 3.3.3.3
Advertising Router: 3.3.3.3
LS Seq Number: 8000000B
Checksum: 0x9455
Length: 48
Number of Links: 2
```

```
Link connected to: another Router (point-to-point)
(Link ID) Neighboring Router ID: 2.2.2.2
(Link Data) Router Interface address: 6.0.0.3
Number of TOS metrics: 0
TOS 0 Metrics: 1
```

```
Link connected to: a Stub Network
(Link ID) Network/subnet number: 6.0.0.0
(Link Data) Network Mask: 255.0.0.0
Number of TOS metrics: 0
TOS 0 Metrics: 1
```

要将路由从一个区域通告到另一个区域，ABR会创建汇总LSA（第3类）。

```
r2.2.2.2#show ip ospf database summary 4.0.0.0
```

```
OSPF Router with ID (2.2.2.2) (Process ID 2)
```

```
Summary Net Link States (Area 0)
```

```
LS age: 172
Options: (No TOS-capability, DC)
LS Type: Summary Links(Network)
Link State ID: 4.0.0.0 (summary Network Number)
!--- The ABR (Router 2.2.2.2) advertises !--- 4.0.0.0/8 into area 0. Advertising Router:
2.2.2.2 LS Seq Number: 80000003 Checksum: 0xFBE8 Length: 28 Network Mask: /8 TOS: 0 Metric: 74
r2.2.2.2#show ip ospf database summary 5.0.0.0
```

```
OSPF Router with ID (2.2.2.2) (Process ID 2)
```

```
Summary Net Link States (Area 0)
```

```
LS age: 1687
Options: (No TOS-capability, DC)
LS Type: Summary Links(Network)
Link State ID: 5.0.0.0 (summary Network Number)
!--- The ABR (Router 2.2.2.2) advertises !--- 5.0.0.0/8 into area 0. Advertising Router:
2.2.2.2 LS Seq Number: 80000004 Checksum: 0x8864 Length: 28 Network Mask: /8 TOS: 0 Metric: 64
r2.2.2.2#show ip ospf database summary 6.0.0.0
```

```
OSPF Router with ID (2.2.2.2) (Process ID 2)
```

Summary Net Link States (Area 1)

LS age: 1697

Options: (No TOS-capability, DC)

LS Type: Summary Links(Network)

Link State ID: 6.0.0.0 (summary Network Number)

!--- The ABR (Router 2.2.2.2) advertises !--- 6.0.0.0/8 into area 1. Advertising Router:

2.2.2.2 LS Seq Number: 8000001C Checksum: 0x7894 Length: 28 Network Mask: /8 TOS: 0 Metric: 1

在本例中，不需要ASBR汇总LSA，因为ABR发起外部LSA，并且ABR可在区域0内到达。请通过查看数据库示例[How OSPF Proach External Routes into Multiple Areas](#)，将此示例与NSSA为正常区域的场景进行比较。

此路由表输出显示9.0.0.0被每个路由器所知的不同的OSPF路由类型。

```
r1.1.1.1#show ip route 9.0.0.0
```

```
Routing entry for 9.0.0.0/8
```

```
Known via "static", distance 1, metric 0
```

```
Redistributing via ospf 4
```

```
Advertised by ospf 4 metric 5 metric-type 1
```

```
Routing Descriptor Blocks:
```

```
* 4.0.0.2
```

```
Route metric is 0, traffic share count is 1
```

```
r2.2.2.2#show ip route ospf
```

```
O 4.0.0.0/8 [110/74] via 5.0.0.1, 01:10:13, Serial0/1/0
```

```
O N1 9.0.0.0/8 [110/79] via 5.0.0.1, 01:07:20, Serial0/1/0
```

```
R3.3.3.3#show ip route ospf
```

```
O IA 4.0.0.0/8 [110/75] via 6.0.0.2, 02:11:14, ATM2/0.20
```

```
O IA 5.0.0.0/8 [110/65] via 6.0.0.2, 03:10:41, ATM2/0.20
```

```
O E1 9.0.0.0/8 [110/80] via 6.0.0.2, 02:08:11, ATM2/0.20
```

故障排除

目前没有针对此配置的故障排除信息。

相关信息

- [OSPF 如何将外部路由传播到多个区域](#)
- [OSPF 数据库说明指南](#)
- [OSPF技术支持](#)
- [IP 路由 支持页](#)
- [技术支持和文档 - Cisco Systems](#)