

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](#)。

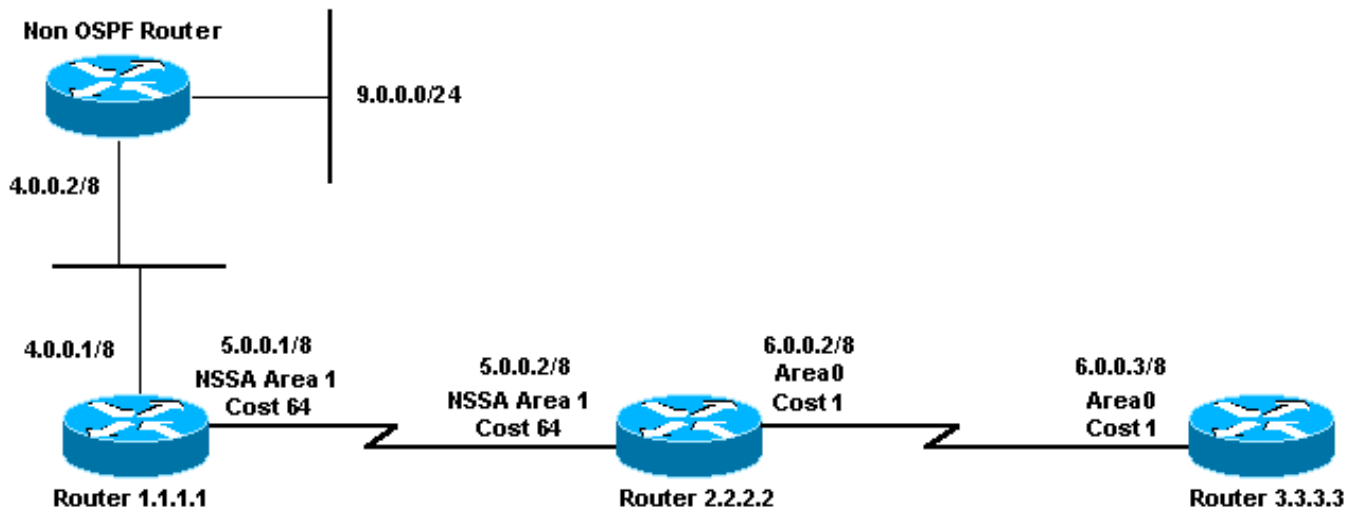
配置

本部分提供有关如何配置本文档所述功能的信息。

注意：要查找本文档所用命令的其他信息，请使用[命令查找工具](#)（[仅限注册用户](#)）。

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的列表并且键入他们到链路状态数据库。此列表仅显示 LSA 报头中的信息。
- **show ip ospf database nssa-external** —显示仅信息关于NSSA外部LSA。
- **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
```

要通告外部路由到NSSA，自治系统边界路由器(ASBR)创建nssa-external LSA (类型7)。

```
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转换类型7 LSA到类型5 LSA，并且传播类型5 LSA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.
```

您能从粗体输出看到此处，虽然路由器2.2.2.2在其配置方面不安排其中任一重新分配语句，它仍然是ASBR，因为转换类型7 LSA到类型5 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

要通告从一个区域的路由到别的，ABR创建汇总LSA (类型3)。

```
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
```

ASBR汇总LSA在这种情况下没有必要，因为ABR产生外部LSA，并且ABR在area 0内是可及的。比较与NSSA是正常区域的方案的此示例通过查看数据库示例[OSPF如何传播外部路由到多个区域](#)。

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支持](#)
- [IP 路由支持页](#)
- [技术支持和文档 - Cisco Systems](#)