鏈路LSA（LSA型別8）和區域內字首（LSA型別9）

目錄

簡介

本檔案介紹兩種新的連結狀態通告(LSA)型別，用於在區域1中直接連線的FastEthernet網段上使用具有簡單指定路由器(DR)的Cisco路由器和開放最短路徑優先(OSPF)v3。

必要條件

需求

思科建議您瞭解以下主題：

- OSPFv2
- IPv6

採用元件

本文中的資訊係根據以下軟體和硬體版本：

- Cisco IOS®
- IOS-XE

本文中的資訊是根據特定實驗室環境內的裝置所建立。文中使用到的所有裝置皆從已清除（預設）的組態來啟動。如果您的網路運作中，請確保您瞭解任何指令可能造成的影響。

背景資訊

OSPFv3對LSA型別進行了一些更改。此處將討論資料包OSPFv2如何交換LSA以交換自始路由。

OSPFv2在LSA 1（路由器LSA）的幫助下交換IPv4路由。這有助於傳播路由。在廣播網段中交換LSA 2（網路LSA）。

當OSPF進程需要交換IPv6路由時，路由器傳送什麼？
為了滿足此要求，新增了兩個幫助交換IPv6路由的新LSA，這些路由在RFC 5340中定義：
https://tools.ietf.org/html/rfc5340
負責承載IPv6路由的LSA:

- LSA型別8:鏈路LSA
- 連結本地範圍：LSA僅在本地鏈路上泛洪，並且進一步用於LINK-LSA
- LSA第9類：區域內LSA
- 區域範圍：LSA僅泛洪到單個OSPF區域。用於路由器LSA、網路LSA、區域間字首LSA、區域間路由器LSA和區域內字首LSA

例如：

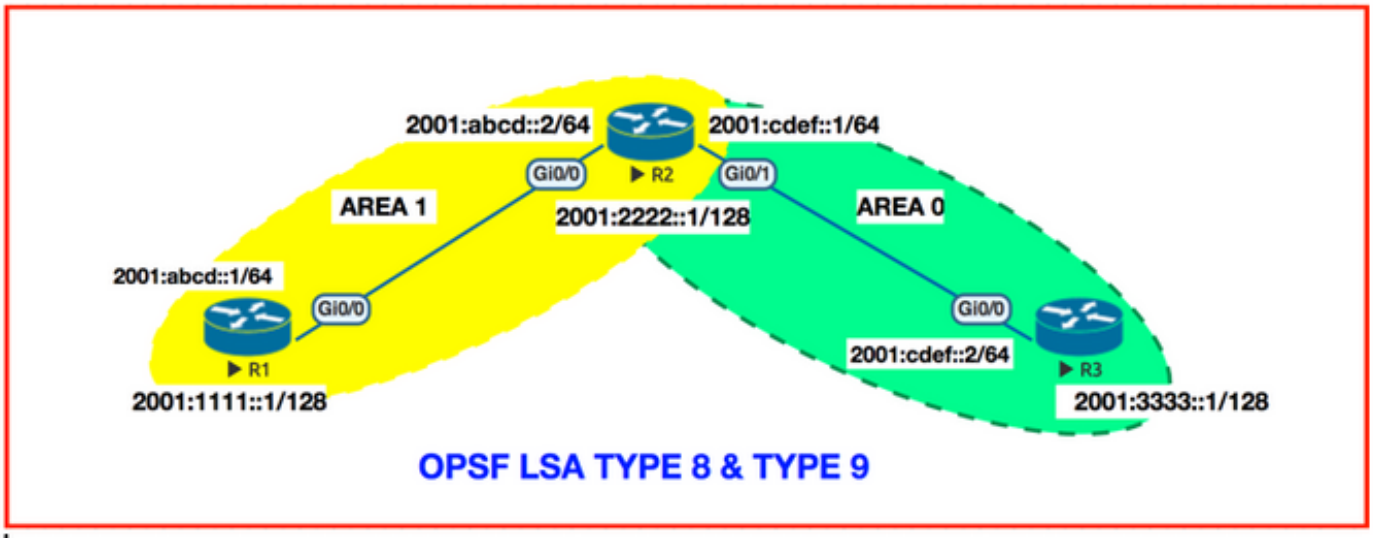
第3類彙總LSA已重新命名**區域間首碼LSA**

第4類彙總LSA已重新命名為**區域間路由器 — LSA**

引入了一個稱為intra-area-prefix-LSA的新LSA。此LSA攜帶所有IPv6字首資訊，這些資訊在IPv4中包括在路由器LSA和網路LSA中。

設定

網路圖表



組態

```
R1#sh running-config | s r o

router ospfv3 1

router-id 1.1.1.1
```

```
!
address-family ipv6 unicast
  passive-interface Loopback0
exit-address-family
R1#
interface GigabitEthernet0/0
no ip address
duplex auto
speed auto
media-type rj45
ipv6 address 2001:ABCD::1/64
ospfv3 1 ipv6 area 1
end
```

驗證

使用本節內容，確認您的組態是否正常運作。

LSA型別8 — 鏈路LSA

為什麼需要鏈路LSA?

這會將自身始發鏈路本地地址通告給連線到那些類似於路由器LSA的鏈路的所有其他路由器。它會向域中的其他路由器通知要與該鏈路關聯的清單IPv6字首的鏈路。

附註：虛擬鏈路不能發起鏈路LSA。

在路由器中時的外觀：

```
R1#sh ospfv3 database link

          OSPFv3 1 address-family ipv6 (router-id 1.1.1.1)

                Link (Type-8) Link States (Area 1)

  LS age: 49
  Options: (V6-Bit, E-Bit, R-Bit, DC-Bit)
  LS Type: Link-LSA (Interface: GigabitEthernet0/0)
  Link State ID: 2 (Interface ID)
  Advertising Router: 1.1.1.1
  LS Seq Number: 80000001
  Checksum: 0xABAA
  Length: 56
  Router Priority: 1
  Link Local Address: FE80::5200:FF:FE01:0
  Number of Prefixes: 1
  Prefix Address: 2001:ABCD::
  Prefix Length: 64, Options: None

  LS age: 129
  Options: (V6-Bit, E-Bit, R-Bit, DC-Bit)
  LS Type: Link-LSA (Interface: GigabitEthernet0/0)
  Link State ID: 2 (Interface ID)
  Advertising Router: 2.2.2.2
  LS Seq Number: 80000001
  Checksum: 0xA1AF
  Length: 56
  Router Priority: 1
  Link Local Address: FE80::5200:FF:FE02:0
  Number of Prefixes: 1
  Prefix Address: 2001:ABCD::
  Prefix Length: 64, Options: None
```

Wireshark捕獲：

```
Frame 115: 218 bytes on wire (1744 bits), 218 bytes captured (1744 bits) on interface 0
Ethernet II, Src: 50:00:00:02:00:00 (50:00:00:02:00:00), Dst: 50:00:00:01:00:00 (50:00:00:01:00:00)
Internet Protocol Version 6, Src: fe80::5200:ff:fe02:0, Dst: fe80::5200:ff:fe01:0
Open Shortest Path First
▶ OSPF Header
▼ LS Update Packet
    Number of LSAs: 3
  ▶ LSA-type 8193 (Router-LSA), len 24
  ▼ LSA-type 8 (Link-LSA), len 56
      .000 0000 0101 0000 = LS Age (seconds): 80
      0... .... .... .... = Do Not Age: False
      LS Type: Link-LSA (0x0008)
      Link State ID: 0.0.0.2
      Advertising Router: 2.2.2.2
      Sequence Number: 0x80000001
      Checksum: 0xa1af
      Length: 56
      Router Priority: 1
    ▼ Options: 0x000033 (DC, R, E, V6)
        .... .... .... .0.. .... .... = AT: Not set
        .... .... .... ..0. .... .... = L: Not set
        .... .... .... ...0 .... .... = AF: Not set
        .... .... .... .... ..1. .... = DC: Set
        .... .... .... .... ...1 .... = R: Set
        .... .... .... .... .... 0... = N: Not set
        .... .... .... .... .... .0.. = MC: Not set
        .... .... .... .... .... ..1. = E: Set
        .... .... .... .... .... ...1 = V6: Set
      Link-local Interface Address: fe80::5200:ff:fe02:0
      # prefixes: 1
      PrefixLength: 64
    ▶ PrefixOptions: 0x00
      Reserved: 0000
      Address Prefix: 2001:abcd::
```

鏈路LSA的LSA型別設定為值0x0008。鏈路LSA具有鏈路本地泛洪範圍。路由器為支援兩台或多台路由器的每個連線鏈路建立單獨的鏈路LSA。

附註：OSPFv3傳送hello資料包，並將源地址作為鏈路本地地址。

LSA第9類 — 區域內字首LSA

區域內字首LSA的LS型別設定為值0x2009。區域內字首LSA具有區域泛洪範圍。

區域內字首LSA的作用是什麼？

在深入瞭解此內容之前，我們先分析一下它是什麼：

```
Frame 115: 218 bytes on wire (1744 bits), 218 bytes captured (1744 bits) on interface 0
Ethernet II, Src: 50:00:00:02:00:00 (50:00:00:02:00:00), Dst: 50:00:00:01:00:00 (50:00:00:01:00:00)
Internet Protocol Version 6, Src: fe80::5200:ff:fe02:0, Dst: fe80::5200:ff:fe01:0
Open Shortest Path First
▶ OSPF Header
▼ LS Update Packet
    Number of LSAs: 3
  ▶ LSA-type 8193 (Router-LSA), len 24
  ▶ LSA-type 8 (Link-LSA), len 56
  ▼ LSA-type 8201 (Intra-Area-Prefix-LSA), len 64
      .000 0000 0101 0000 = LS Age (seconds): 80
      0... .... .... .... = Do Not Age: False
      LS Type: Intra-Area-Prefix-LSA (0x2009)
      Link State ID: 0.0.0.0
      Advertising Router: 2.2.2.2
      Sequence Number: 0x80000001
      Checksum: 0x0a33
      Length: 64
      # prefixes: 2
      Referenced LS type: Router-LSA (0x2001)
      Referenced Link State ID: 0.0.0.0
      Referenced Advertising Router: 2.2.2.2
      PrefixLength: 128
    ▶ PrefixOptions: 0x02 ((LA) Local Address)
      Metric: 0
      Address Prefix: 2001:222::1
      PrefixLength: 64
    ▶ PrefixOptions: 0x00
      Metric: 1
      Address Prefix: 2001:abcd::
```

它帶有地址字首2001:abcd::/64。它通過引用網路LSA來將IPv6地址字首清單與傳輸網路連結相關聯，或者通過引用將IPv6地址清單與路由器相關聯路由器LSA。末節鏈路字首與其連線的路由器關聯。

基本上，它是IPv4 OSPF中使用的LSA型別1和LSA型別2，用於通告區域內的字首。

```
R1#sh ospfv3 database

          OSPFv3 1 address-family ipv6 (router-id 1.1.1.1)

               Router Link States (Area 1)

ADV Router       Age         Seq#       Fragment ID  Link count  Bits
 1.1.1.1         1019        0x80000004 0            1           None
 2.2.2.2         1065        0x80000005 0            1           None

               Net Link States (Area 1)

ADV Router       Age         Seq#       Link ID    Rtr count
 2.2.2.2         1065        0x80000004 2          2

               Link (Type-8) Link States (Area 1)

ADV Router       Age         Seq#       Link ID    Interface
 1.1.1.1         1019        0x80000004 2          Gi0/0
 2.2.2.2         1065        0x80000004 2          Gi0/0

               Intra Area Prefix Link States (Area 1)

ADV Router       Age         Seq#       Link ID    Ref-lstype  Ref-LSID
 2.2.2.2         1065        0x80000005 0          0x2001      0
 2.2.2.2         1065        0x80000004 2048       0x2002      2
```

```
R1#sh ospfv3 database prefix

          OSPFv3 1 address-family ipv6 (router-id 1.1.1.1)

                Intra Area Prefix Link States (Area 1)

  LS age: 1191
  LS Type: Intra-Area-Prefix-LSA
  Link State ID: 0
  Advertising Router: 2.2.2.2
  LS Seq Number: 80000005
  Checksum: 0xA77A
  Length: 52
  Referenced LSA Type: 2001
  Referenced Link State ID: 0
  Referenced Advertising Router: 2.2.2.2
  Number of Prefixes: 1
  Prefix Address: 2001:222::1
  Prefix Length: 128, Options: LA, Metric: 0

  LS age: 1191
  LS Type: Intra-Area-Prefix-LSA
  Link State ID: 2048
  Advertising Router: 2.2.2.2
  LS Seq Number: 80000004
  Checksum: 0x10D
  Length: 44
  Referenced LSA Type: 2002
  Referenced Link State ID: 2
  Referenced Advertising Router: 2.2.2.2
  Number of Prefixes: 1
  Prefix Address: 2001:ABCD::
  Prefix Length: 64, Options: None, Metric: 0
```

疑難排解

目前尚無適用於此組態的具體疑難排解資訊。

相關資訊

- https://tools.ietf.org/html/rfc5340
- 技術支援與文件 - Cisco Systems