Conversione annuncio stato collegamento OSPF tipo 7 a tipo 5 area di stub non corrispondente

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Introduzione

In questo documento viene illustrato come Open Shortest Path First (OSPF) converte un annuncio Link State (LSA) di tipo 7 per un'area di stub non corrispondente in un annuncio LSA di tipo 5.

Prerequisiti

Requisiti

Nessun requisito specifico previsto per questo documento.

Componenti usati

Il documento può essere consultato per tutte le versioni software o hardware.

Convenzioni

Per ulteriori informazioni sulle convenzioni usate, consultare il documento Cisco sulle convenzioni nei suggerimenti tecnici.

Configurazione

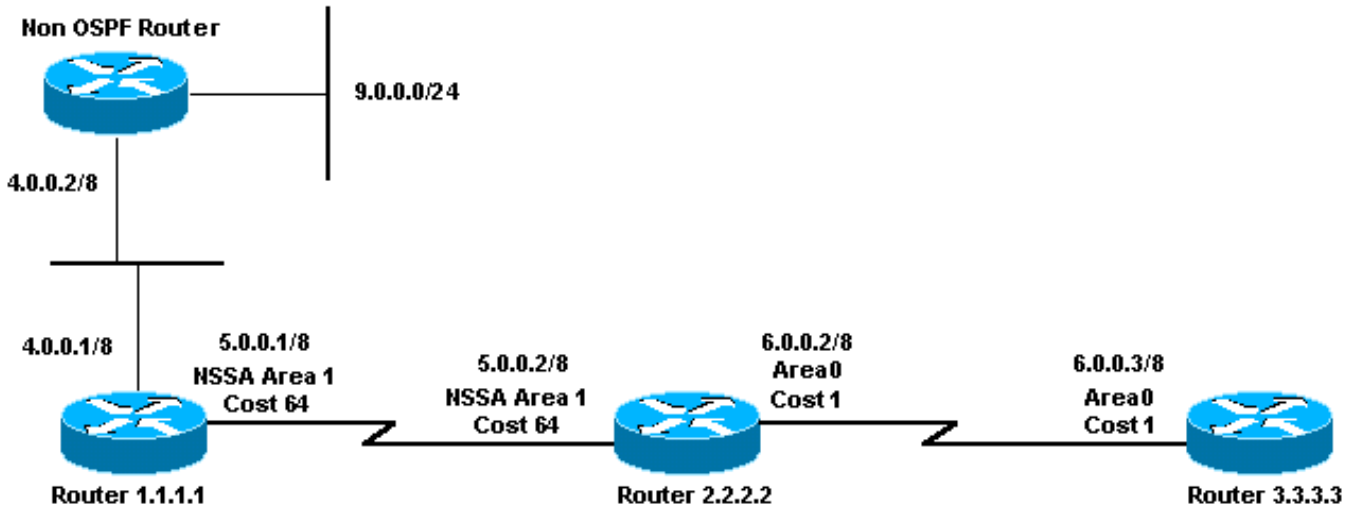
In questa sezione vengono presentate le informazioni necessarie per configurare le funzionalità

descritte più avanti nel documento.

Nota: per ulteriori informazioni sui comandi menzionati in questo documento, usare lo strumento di ricerca dei comandi (solo utenti registrati).

Esempio di rete

Nel documento viene usata l'impostazione di rete mostrata nel diagramma.



Configurazioni

Nel documento vengono usate le configurazioni mostrate di seguito.

- Router 1.1.1.1
- Router 2.2.2.2
- Router 3.3.3.3

Router 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
```

Router 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
```

Router 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
```

Verifica

Le informazioni contenute in questa sezione permettono di verificare che la configurazione funzioni correttamente.

Alcuni comandi **show sono supportati dallo** strumento Output Interpreter (solo utenti registrati); lo strumento permette di visualizzare un'analisi dell'output del comando **show.**

- **show ip ospf database**: visualizza una lista degli LSA e li digita in un database dello stato del collegamento. In questo elenco vengono visualizzate solo le informazioni nell'intestazione LSA.
- **show ip ospf database nssa-external**: visualizza solo le informazioni sulle LSA esterne NSSA.
- **show ip ospf database external**: visualizza solo le informazioni sulle LSA esterne.
- **show ip ospf database [router] [link-state-id]**: visualizza un elenco di tutte le LSA di un router presenti nel database. Le LSA sono prodotte da ogni router e queste LSA fondamentali elencano tutti i collegamenti dei router, o interfacce, insieme agli stati e ai costi in uscita dei

collegamenti. Esse sono inondate soltanto all'interno della zona di provenienza.
- **show ip ospf database summary** *<link-state id>* : visualizza i collegamenti di riepilogo del router di confine area (ABR).
- show ip route: visualizza lo stato corrente della tabella di routing.

Esaminare il database OSPF

Per verificare l'aspetto del database OSPF in questo ambiente di rete, utilizzare il comando **show ip ospf database**.

```
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
```

Per annunciare le route esterne in un'istanza NSSA, il router ASBR (Autonomal System Boundary Router) crea LSA nssa-esterne (tipo 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.
```

La funzione ABR converte le LSA di tipo 7 in LSA di tipo 5 e le propaga in aree normali.

```
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.
```

Come si evince dall'output in **grassetto**, il router 2.2.2.2 non dispone di istruzioni **redistribute** nella configurazione, ma è comunque un ASBR perché converte le LSA di tipo 7 in LSA di tipo 5.

```
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
```

Per pubblicizzare le route da un'area a un'altra, il rapporto ABR crea LSA di riepilogo (tipo 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
```

Le LSA di riepilogo ASBR non sono necessarie in questo caso perché ABR ha origine dalla LSA esterna e è raggiungibile all'interno dell'area 0. Confrontare questo esempio con uno scenario in cui l'NSA era un'area normale esaminando l'esempio del database Come OSPF propaga le route esterne in più aree.

In questo output della tabella di routing vengono mostrati i diversi tipi di route OSPF conosciute come 9.0.0.0 da ogni router.

```
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
```

Risoluzione dei problemi

Al momento non sono disponibili informazioni specifiche per la risoluzione dei problemi di questa configurazione.

Informazioni correlate

- Propagazione delle route esterne in più aree da parte di OSPF

- Guida esplicativa del database OSPF
- Supporto tecnologia OSPF
- Pagina di supporto per il routing IP
- Documentazione e supporto tecnico – Cisco Systems