

Compreenda OSPFv3 COMO o cálculo externo da rota LSA

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Introdução

Este documento descreve tipo mecanismo da propaganda do estado do link externo do sistema autônomo da versão 3 do caminho mais curto aberto o primeiro (OSPFv3) (LSA) da seleção de rota 5. Apresenta um cenário de rede com a configuração para que como selecione a rota recebida de um roteador de limite de sistema autônomo (ASBR) sobre outro.

Pré-requisitos

Requisitos

Cisco recomenda que você tem o conhecimento da distribuição OSPFv3 e de IPv6.

[Componentes Utilizados](#)

Este documento não se restringe a versões de software e hardware específicas.

As informações neste documento foram criadas a partir de dispositivos em um ambiente de laboratório específico. Todos os dispositivos utilizados neste documento foram iniciados com uma configuração (padrão) inicial. Se a sua rede estiver ativa, certifique-se de que entende o impacto potencial de qualquer comando.

Informações de Apoio

Se as rotas são redistribuídas em OSPFv3 de outros protocolos de roteamento do IPv6 ou das rotas estáticas do IPv6, estas rotas transformam-se rotas Como-externos OSPF à revelia. Estas

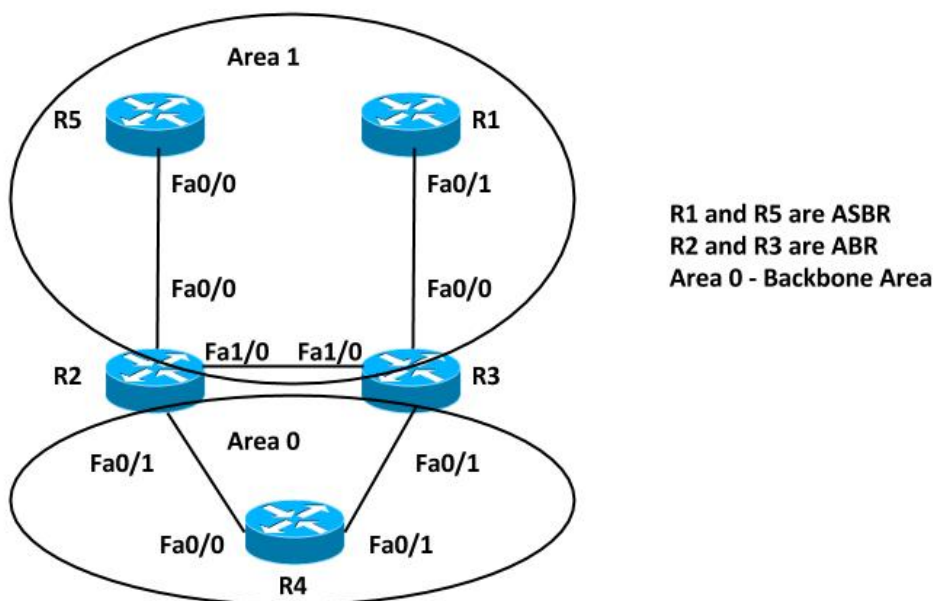
rotas Como-externos caem sob duas categorias, o tipo-1 externo (O E1) e o tipo-2 externo (O E2).

A diferença entre os dois está na maneira que o custo (métrica) da rota é calculado. O custo de uma rota tipo 2 é sempre o custo externo, independente do custo interior para alcançar aquela rota. O custo de um tipo-1 rota é a adição dos custos externos e dos custos internos usados para alcançar essa rota. Uma rota de tipo 1 é sempre preferível em relação a uma de tipo 2 para o mesmo destino.

Configurar

Diagrama de Rede

Considere a topologia de rede abaixo verificar o como Isa externo 5 recebido no R4 na área 0 que originou dos ASBR na área 1. R2 e R3 é os roteadores de borda de área (ABR).



Configurações

Para a simplicidade, esta configuração redistribui a rota estática do IPv6 em ASBR no 1 Router R5 da área e no r1.

```
R5#  
ipv6 route FD00:AAAA:BBBB:CCCC::/64 Null0
```

```

!
interface FastEthernet0/0
  ipv6 address FD00:AAAA:BBBB:25::5/64
  ipv6 ospf 10 area 1
!
ipv6 router ospf 10
  router-id 192.168.1.5
  redistribute static

R1#

ipv6 route FD00:AAAA:BBBB:CCCC::/64 Null0
!
interface FastEthernet0/1
  ipv6 address FD00:AAAA:BBBB:13::1/64
  ipv6 ospf 10 area 1
!
ipv6 router ospf 10
  router-id 192.168.1.1
  redistribute static

```

Note: Se uma métrica não é especificada, OSPFv3 põe um valor padrão de 20 quando redistribui rotas de todos os protocolos exceto as rotas (BGP) de protocolo de gateway de borda, que recebem uma métrica de 1.

Verificar

Você pode usar estes comandos a fim verificar a redistribuição:

```

R5#show ipv6 ospf
Routing Process "ospfv3 10" with ID 192.168.1.5
Event-log enabled, Maximum number of events: 1000, Mode: cyclic
It is an autonomous system boundary router
Redistributing External Routes from,
  static
Router is not originating router-LSAs with maximum metric
Initial SPF schedule delay 5000 msec
Minimum hold time between two consecutive SPFs 10000 msec
Maximum wait time between two consecutive SPFs 10000 msec
Minimum LSA interval 5 secs
Minimum LSA arrival 1000 msec
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msec
Retransmission pacing timer 66 msec
Number of external LSA 2. Checksum Sum 0x0100D4
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Graceful restart helper support enabled
Reference bandwidth unit is 100 mbps
RFC1583 compatibility enabled
  Area 1
    Number of interfaces in this area is 1
    SPF algorithm executed 5 times
    Number of LSA 16. Checksum Sum 0x08011B
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0

```

```

R1#show ipv6 ospf

```

```
Routing Process "ospfv3 10" with ID 192.168.1.1
Event-log enabled, Maximum number of events: 1000, Mode: cyclic
It is an autonomous system boundary router
Redistributing External Routes from,
  static
Router is not originating router-LSAs with maximum metric
Initial SPF schedule delay 5000 msec
Minimum hold time between two consecutive SPFs 10000 msec
Maximum wait time between two consecutive SPFs 10000 msec
Minimum LSA interval 5 secs
Minimum LSA arrival 1000 msec
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msec
Retransmission pacing timer 66 msec
Number of external LSA 2. Checksum Sum 0x0100D4
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Graceful restart helper support enabled
Reference bandwidth unit is 100 mbps
RFC1583 compatibility enabled
  Area 1
    Number of interfaces in this area is 1
    SPF algorithm executed 6 times
    Number of LSA 16. Checksum Sum 0x08AD19
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
```

Assim, ambos os roteadores ASBR, R5 e r1 redistribuem as rotas estáticas do IPv6. A fim de verificar a rota redistribuída na tabela de roteamento e no base de dados OSPFv3 no roteador R4 para ver se há o prefixo FD00:AAAA:BBBB:CCCC::/64, incorpore este comando:

```

R4#show ipv6 route FD00:AAAA:BBBB:CCCC::/64
Routing entry for FD00:AAAA:BBBB:CCCC::/64
Known via "ospf 10", distance 110, metric 20, type extern 2
Route count is 2/2, share count 0
Routing paths:
  FE80::C801:37FF:FE2C:6, FastEthernet0/0
    Last updated 00:04:17 ago
  FE80::C802:BFF:FE4:6, FastEthernet0/1
    Last updated 00:04:17 ago

```

- Both the LSAs are installed in the Routing Table

```

R4#show ipv6 ospf database external FD00:AAAA:BBBB:CCCC::/64

OSPFv3 Router with ID (192.168.1.4) (Process ID 10)

```

Type-5 AS External Link States

Routing Bit Set on this LSA

```

LS age: 285
LS Type: AS External Link
Link State ID: 0
Advertising Router: 192.168.1.1
LS Seq Number: 80000001
Checksum: 0x8C60
Length: 36
Prefix Address: FD00:AAAA:BBBB:CCCC::
Prefix Length: 64, Options: None
Metric Type: 2 (Larger than any link state path)
Metric: 20

```

- Advertising Routers are R1 (192.168.1.1) and R5 (192.168.1.5)
- OSPF External type 2 routes - OE2
- Metric is 20

Routing Bit Set on this LSA

```

LS age: 288
LS Type: AS External Link
Link State ID: 0
Advertising Router: 192.168.1.5
LS Seq Number: 80000001
Checksum: 0x7474
Length: 36
Prefix Address: FD00:AAAA:BBBB:CCCC::
Prefix Length: 64, Options: None
Metric Type: 2 (Larger than any link state path)
Metric: 20

```

Métrica redistribuída

Como mencionado mais cedo, o valor de métrica está ajustado à revelia a 20 quando as rotas são redistribuídas em OSPFv3. Em seguida, defina o valor 10 quando você redistribuir em ASBR 192.168.1.1 (r1) e verificar a saída em Roteador4.

Estão aqui as mudanças executadas no r1:

```
R1#show ipv6 ospf
```

```

Routing Process "ospfv3 10" with ID 192.168.1.1
Event-log enabled, Maximum number of events: 1000, Mode: cyclic
It is an autonomous system boundary router
Redistributing External Routes from,
  static
Router is not originating router-LSAs with maximum metric
Initial SPF schedule delay 5000 msec
Minimum hold time between two consecutive SPFs 10000 msec
Maximum wait time between two consecutive SPFs 10000 msec
Minimum LSA interval 5 secs
Minimum LSA arrival 1000 msec
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msec
Retransmission pacing timer 66 msec
Number of external LSA 2. Checksum Sum 0x0100D4
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Graceful restart helper support enabled
Reference bandwidth unit is 100 mbps

```

RFC1583 compatibility enabled

Area 1

Number of interfaces in this area is 1
SPF algorithm executed 6 times
Number of LSA 16. Checksum Sum 0x08AD19
Number of DCbitless LSA 0
Number of indication LSA 0
Number of DoNotAge LSA 0
Flood list length 0

A tabela de roteamento mostra agora somente uma entrada na tabela de roteamento do IPv6. Verifique a base de dados do OSPF mais para ver se há este como lsa externo:

```
R4#show ipv6 route FD00:AAAA:BBBB:CCCC::/64
```

```
Routing entry for FD00:AAAA:BBBB:CCCC::/64
Known via "ospf 10", distance 110, metric 10, type extern 2
Route count is 1/1, share count 0
Routing paths:
  FE80::C802:BFF:FEB4:6, FastEthernet0/1
  Last updated 00:00:19 ago
```

- Only the LSA with lower metric 10 is installed in the Routing Table

```
R4#show ipv6 ospf database external FD00:AAAA:BBBB:CCCC::/64
```

```
OSPFv3 Router with ID (192.168.1.4) (Process ID 10)
```

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

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

```
LS age: 34
LS Type: AS External Link
Link State ID: 0
Advertising Router: 192.168.1.1
LS Seq Number: 80000002
Checksum: 0x4EA7
Length: 36
Prefix Address: FD00:AAAA:BBBB:CCCC::
Prefix Length: 64, Options: None
Metric Type: 2 (Larger than any link state path)
Metric: 10
```

- Advertising Routers are R1 (192.168.1.1) and R5 (192.168.1.5)
- OSPF External type 2 routes - OE2

```
LS age: 382
LS Type: AS External Link
Link State ID: 0
Advertising Router: 192.168.1.5
LS Seq Number: 80000001
Checksum: 0x7474
Length: 36
Prefix Address: FD00:AAAA:BBBB:CCCC::
Prefix Length: 64, Options: None
Metric Type: 2 (Larger than any link state path)
Metric: 20
```

Envie a métrica

A métrica dianteira é o custo para alcançar o ASBR do roteador. Isto pode ser verificado com estes comandos:

```
R1#show ipv6 ospf
```

```
Routing Process "ospfv3 10" with ID 192.168.1.1
Event-log enabled, Maximum number of events: 1000, Mode: cyclic
It is an autonomous system boundary router
Redistributing External Routes from,
  static
Router is not originating router-LSAs with maximum metric
Initial SPF schedule delay 5000 msec
Minimum hold time between two consecutive SPF's 10000 msec
```

```
Maximum wait time between two consecutive SPFs 10000 msec
Minimum LSA interval 5 secs
Minimum LSA arrival 1000 msec
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msec
Retransmission pacing timer 66 msec
Number of external LSA 2. Checksum Sum 0x0100D4
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Graceful restart helper support enabled
Reference bandwidth unit is 100 mbps
RFC1583 compatibility enabled
```

Area 1

```
Number of interfaces in this area is 1
SPF algorithm executed 6 times
Number of LSA 16. Checksum Sum 0x08AD19
Number of DCbitless LSA 0
Number of indication LSA 0
Number of DoNotAge LSA 0
Flood list length 0
```

Nesta saída, o custo para alcançar ASBR (r1 e R5) é 2 do roteador R4. À revelia, o custo para a interface fastethernet em OSPFv3 é 1. Tão neste caso, o custo é 2 do R4 para alcançar o r1 ou o R5: Custo dianteiro da métrica = do roteador para alcançar ABR (1) + custo ABR para alcançar o ASBR (1) = 2.

Mude a métrica da redistribuição ao 10 no R5 também, assim que ambas as rotas são instaladas outra vez na tabela de roteamento do IPv6.

Estão aqui as mudanças executadas no R5:

R1#show ipv6 ospf

```
Routing Process "ospfv3 10" with ID 192.168.1.1
Event-log enabled, Maximum number of events: 1000, Mode: cyclic
It is an autonomous system boundary router
Redistributing External Routes from,
static
Router is not originating router-LSAs with maximum metric
Initial SPF schedule delay 5000 msec
Minimum hold time between two consecutive SPFs 10000 msec
Maximum wait time between two consecutive SPFs 10000 msec
Minimum LSA interval 5 secs
Minimum LSA arrival 1000 msec
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msec
Retransmission pacing timer 66 msec
Number of external LSA 2. Checksum Sum 0x0100D4
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Graceful restart helper support enabled
Reference bandwidth unit is 100 mbps
RFC1583 compatibility enabled
Area 1
Number of interfaces in this area is 1
SPF algorithm executed 6 times
Number of LSA 16. Checksum Sum 0x08AD19
Number of DCbitless LSA 0
Number of indication LSA 0
Number of DoNotAge LSA 0
Flood list length 0
```

A tabela de roteamento do IPv6 e o RIB OSPFv3 no R4 mostram:

R1#show ipv6 ospf

```
Routing Process "ospfv3 10" with ID 192.168.1.1
Event-log enabled, Maximum number of events: 1000, Mode: cyclic
It is an autonomous system boundary router
Redistributing External Routes from,
  static
Router is not originating router-LSAs with maximum metric
Initial SPF schedule delay 5000 msec
Minimum hold time between two consecutive SPF's 10000 msec
Maximum wait time between two consecutive SPF's 10000 msec
Minimum LSA interval 5 secs
Minimum LSA arrival 1000 msec
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msec
Retransmission pacing timer 66 msec
Number of external LSA 2. Checksum Sum 0x0100D4
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Graceful restart helper support enabled
Reference bandwidth unit is 100 mbps
RFC1583 compatibility enabled
  Area 1
    Number of interfaces in this area is 1
    SPF algorithm executed 6 times
    Number of LSA 16. Checksum Sum 0x08AD19
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
```

Deixa agora a mudança o custo alcançar um dos ASBR mas com a mesma métrica da redistribuição e verificar a mesma saída.

Aumente o OSPFv3 custado no Fa0/1 para o roteador R4:

R1#show ipv6 ospf

```
Routing Process "ospfv3 10" with ID 192.168.1.1
Event-log enabled, Maximum number of events: 1000, Mode: cyclic
It is an autonomous system boundary router
Redistributing External Routes from,
  static
Router is not originating router-LSAs with maximum metric
Initial SPF schedule delay 5000 msec
Minimum hold time between two consecutive SPF's 10000 msec
Maximum wait time between two consecutive SPF's 10000 msec
Minimum LSA interval 5 secs
Minimum LSA arrival 1000 msec
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msec
Retransmission pacing timer 66 msec
Number of external LSA 2. Checksum Sum 0x0100D4
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Graceful restart helper support enabled
Reference bandwidth unit is 100 mbps
RFC1583 compatibility enabled
  Area 1
    Number of interfaces in this area is 1
    SPF algorithm executed 6 times
    Number of LSA 16. Checksum Sum 0x08AD19
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
```


Verifique a métrica dianteira. Mostra que agora o custo para alcançar o r1 ASBR é 11 da relação do Fa0/1:

R1#show ipv6 ospf

```
Routing Process "ospfv3 10" with ID 192.168.1.1
Event-log enabled, Maximum number of events: 1000, Mode: cyclic
It is an autonomous system boundary router
Redistributing External Routes from,
  static
Router is not originating router-LSAs with maximum metric
Initial SPF schedule delay 5000 msec
Minimum hold time between two consecutive SPF's 10000 msec
Maximum wait time between two consecutive SPF's 10000 msec
Minimum LSA interval 5 sec
Minimum LSA arrival 1000 msec
LSA group pacing timer 240 sec
Interface flood pacing timer 33 msec
Retransmission pacing timer 66 msec
Number of external LSA 2. Checksum Sum 0x0100D4
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Graceful restart helper support enabled
Reference bandwidth unit is 100 mbps
RFC1583 compatibility enabled
  Area 1
    Number of interfaces in this area is 1
    SPF algorithm executed 6 times
    Number of LSA 16. Checksum Sum 0x08AD19
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
```

Agora a tabela de roteamento do IPv6 e o RIB OSPFv3 no R4 mostram:

R1#show ipv6 ospf

```
Routing Process "ospfv3 10" with ID 192.168.1.1
Event-log enabled, Maximum number of events: 1000, Mode: cyclic
It is an autonomous system boundary router
Redistributing External Routes from,
  static
Router is not originating router-LSAs with maximum metric
Initial SPF schedule delay 5000 msec
Minimum hold time between two consecutive SPF's 10000 msec
Maximum wait time between two consecutive SPF's 10000 msec
Minimum LSA interval 5 sec
Minimum LSA arrival 1000 msec
LSA group pacing timer 240 sec
Interface flood pacing timer 33 msec
Retransmission pacing timer 66 msec
Number of external LSA 2. Checksum Sum 0x0100D4
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Graceful restart helper support enabled
Reference bandwidth unit is 100 mbps
RFC1583 compatibility enabled
  Area 1
    Number of interfaces in this area is 1
    SPF algorithm executed 6 times
    Number of LSA 16. Checksum Sum 0x08AD19
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
```

Flood list length 0

A rota com a métrica dianteira mais baixa é instalada assim na tabela de roteamento do IPv6.

Em resumo, quando você tem entradas múltiplas para o como Isa externo, a primeira preferência é dada à métrica (métrica redistribuída). A rota com a métrica mais baixa é instalada na tabela de roteamento do IPv6. A segunda preferência está dada à métrica dianteira, se a métrica redistribuída é mesma. A rota com a métrica dianteira mais baixa é instalada na tabela de roteamento do IPv6.