

了解OSPF中转发地址的选择

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简介

本文档介绍在OSPF（开放最短路径优先）域中由ASBR（自治系统边界路由器）为外部LSA（链路状态通告）选择转发地址时使用的概念。

先决条件

要求

本文档的读者应掌握以下这些主题的相关知识：

- 基本IP路由。
- OSPF 路由协议概念和术语。

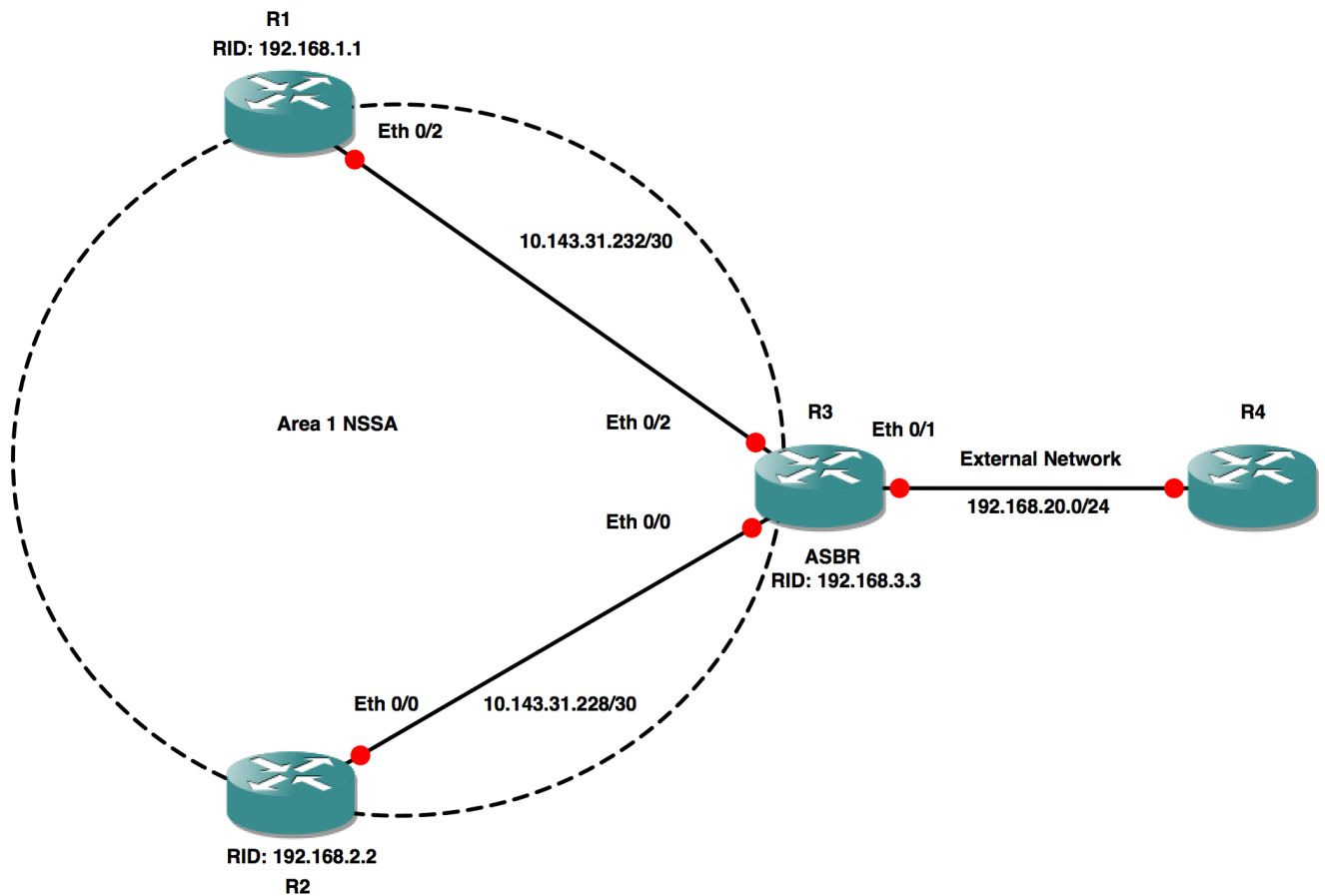
使用的组件

本文档不限于特定的软件和硬件版本。

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

验证

以下图像将用作文档其余部分的示例拓扑。



R3使用路由映射将网络192.168.20.0/24重分发到OSPF NSSA (非末节区域)。您可以使用任何方法将路由重分布到OSPF域。

R3的相关配置：

```
router ospf 1
router-id 192.168.3.3
area 1 nssa
redistribute connected metric-type 1 subnets route-map CONN
network 10.143.31.0 0.0.0.255 area 1
```

```
route-map CONN, permit, sequence 10
Match clauses:
interface Ethernet0/1
Set clauses:
Policy routing matches: 0 packets, 0 bytes
```

```
interface Ethernet0/1
ip address 192.168.20.1 255.255.255.0
```

OSPF

R1#sh ip ospf neighbor

Neighbor ID	Pri	State	Dead Time	Address	Interface
192.168.3.3	0	FULL/ -	00:00:38	10.143.31.234	Ethernet0/2

R2#sh ip ospf neighbor

Neighbor ID	Pri	State	Dead Time	Address	Interface
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```
192.168.3.3      0    FULL/ -      00:00:36    10.143.31.230    Ethernet0/0
```

```
R3#sh ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
192.168.1.1	0	FULL/ -	00:00:34	10.143.31.233	Ethernet0/2
192.168.2.2	0	FULL/ -	00:00:30	10.143.31.229	Ethernet0/0

如果查看R1和R2上外部路由“192.168.20.0”的度量，您会发现R1上的度量为30,R2上的度量为40。即使它们以相同方式连接到R3，也会有所不同。

```
R1#sh ip route 192.168.20.0
```

```
Routing entry for 192.168.20.0/24
```

```
Known via "ospf 1", distance 110, metric 30, type NSSA extern 1
```

```
Last update from 10.143.31.234 on Ethernet0/2, 00:00:31 ago
```

```
Routing Descriptor Blocks:
```

```
* 10.143.31.234, from 192.168.3.3, 00:00:31 ago, via Ethernet0/2
```

```
Route metric is 30, traffic share count is 1
```

```
R2#sh ip route 192.168.20.0
```

```
Routing entry for 192.168.20.0/24
```

```
Known via "ospf 1", distance 110, metric 40, type NSSA extern 1
```

```
Last update from 10.143.31.230 on Ethernet0/0, 00:00:26 ago
```

```
Routing Descriptor Blocks:
```

```
* 10.143.31.230, from 192.168.3.3, 00:00:26 ago, via Ethernet0/0
```

```
Route metric is 40, traffic share count is 1
```

R1和R2上此前缀的LSA信息：

```
R1#sh ip ospf database nssa-external
```

```
OSPF Router with ID (192.168.1.1) (Process ID 1)
```

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

```
Routing Bit Set on this LSA in topology Base with MTID 0
```

```
LS age: 334
```

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

```
LS Type: AS External Link
```

```
Link State ID: 192.168.20.0 (External Network Number )
```

```
Advertising Router: 192.168.3.3
```

```
LS Seq Number: 80000003
```

```
Checksum: 0xA0E3
```

```
Length: 36
```

```
Network Mask: /24
```

```
Metric Type: 1 (Comparable directly to link state metric)
```

```
MTID: 0
```

```
Metric: 20
```

```
Forward Address: 10.143.31.234
```

```
External Route Tag: 0
```

```
R2#sh ip ospf database nssa-external
```

```
OSPF Router with ID (192.168.2.2) (Process ID 1)
```

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

```

Routing Bit Set on this LSA in topology Base with MTID 0
LS age: 352
Options: (No TOS-capability, Type 7/5 translation, DC, Upward)
LS Type: AS External Link
Link State ID: 192.168.20.0 (External Network Number )
Advertising Router: 192.168.3.3
LS Seq Number: 80000003
Checksum: 0xA0E3
Length: 36
Network Mask: /24
  Metric Type: 1 (Comparable directly to link state metric)
  MTID: 0
  Metric: 20
  Forward Address: 10.143.31.234
  External Route Tag: 0

```

您可以看到R1和R2上第7类LSA的转发地址相同。此转发地址属于R3和R1之间的接口。此转发地址直接连接到R1，但R2可通过R3访问。这意味着转发地址离R2的一跳。

如果R3选择R3和R2之间链路的IP地址作为转发地址，R1上将出现类似情况。

在ASBR上使用以下规则选择转发地址：

1. 如果区域中配置了环回，则环回的IP地址被选为转发地址。
2. 如果不满足第一个条件，则OSPF接口列表中第一个接口的IP地址将被选为转发地址。您可以使用“show ip ospf interface brief”命令查看OSPF接口列表。顶部的接口是连接到OSPF的最后一个接口。

```

R3#sh ip ospf interface brief
Interface      PID   Area          IP Address/Mask    Cost  State Nbrs F/C
Et0/2        1     1             10.143.31.234/30  10    P2P  1/1
Et0/0          1     1             10.143.31.230/30  10    P2P   1/1

```

Et0/2显示在“show ip ospf interface brief”顶部，这是选择其IP地址作为转发地址的原因。

将Et0/0的配置更改为默认配置将使其与OSPF分离。再次添加配置会将其连回OSPF。此后，Et0/0将列在“show ip ospf interface brief”输出顶部。

```

R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#
R3(config)#default interface e0/0
Interface Ethernet0/0 set to default configuration

*Aug  3 11:25:47.625: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.2.2 on Ethernet0/0 from FULL to
DOWN, Neighbor Down: Interface down or detached

R3(config)#interface Ethernet0/0
R3(config-if)# ip address 10.143.31.230 255.255.255.252
R3(config-if)# ip ospf network point-to-point
R3(config-if)#end

R3#*Aug  3 11:26:03.995: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.2.2 on Ethernet0/0 from LOADING
to FULL, Loading Done

```

```
R3#sh ip ospf interface brief
Interface  PID  Area          IP Address/Mask  Cost  State Nbrs F/C
Et0/0     1   1            10.143.31.230/30  10   P2P   1/1
Et0/2     1   1            10.143.31.234/30  10   P2P   1/1
```

此更改将导致重新计算转发地址到Et0/0上配置的IP地址的转发地址。

```
R1#sh ip ospf database nssa-external

      OSPF Router with ID (192.168.1.1) (Process ID 1)

      Type-7 AS External Link States (Area 1)

Routing Bit Set on this LSA in topology Base with MTID 0
LS age: 284
Options: (No TOS-capability, Type 7/5 translation, DC, Upward)
LS Type: AS External Link
Link State ID: 192.168.20.0 (External Network Number )
Advertising Router: 192.168.3.3
LS Seq Number: 80000004
Checksum: 0x6621
Length: 36
Network Mask: /24
  Metric Type: 1 (Comparable directly to link state metric)
  MTID: 0
  Metric: 20
  Forward Address: 10.143.31.230
  External Route Tag: 0
```

```
R2#sh ip ospf database nssa-external

      OSPF Router with ID (192.168.2.2) (Process ID 1)

      Type-7 AS External Link States (Area 1)

Routing Bit Set on this LSA in topology Base with MTID 0
LS age: 303
Options: (No TOS-capability, Type 7/5 translation, DC, Upward)
LS Type: AS External Link
Link State ID: 192.168.20.0 (External Network Number )
Advertising Router: 192.168.3.3
LS Seq Number: 80000004
Checksum: 0x6621
Length: 36
Network Mask: /24
  Metric Type: 1 (Comparable directly to link state metric)
  MTID: 0
  Metric: 20
  Forward Address: 10.143.31.230
  External Route Tag: 0
```

现在，“show ip route”的输出将显示R1上到达外部路由的度量为40,R2上到达外部路由的度量为30。这与之前的输出相反。

```
R1#sh ip route 192.168.20.0
Routing entry for 192.168.20.0/24
  Known via "ospf 1", distance 110, metric 40, type NSSA extern 1
  Last update from 10.143.31.234 on Ethernet0/2, 00:06:14 ago
  Routing Descriptor Blocks:
  * 10.143.31.234, from 192.168.3.3, 00:06:14 ago, via Ethernet0/2
```

```
Route metric is 40, traffic share count is 1
```

```
R2#sh ip route 192.168.20.0
Routing entry for 192.168.20.0/24
  Known via "ospf 1", distance 110, metric 30, type NSSA extern 1
  Last update from 10.143.31.230 on Ethernet0/0, 00:06:29 ago
  Routing Descriptor Blocks:
  * 10.143.31.230, from 192.168.3.3, 00:06:29 ago, via Ethernet0/0
    Route metric is 30, traffic share count is 1
```

此更改可能不可预测，并会导致网络收敛，因此建议将环回IP地址作为转发地址。

```
R3(config)#int lo0
R3(config-if)#ip address 192.168.3.3 255.255.255.255
R3(config-if)#router ospf 1
R3(config-router)#network 192.168.3.3 0.0.0.0 area 1
R3(config-router)#end
```

这也会导致R1和R2上的度量相等：

```
R1#sh ip ospf database nssa-external

      OSPF Router with ID (192.168.1.1) (Process ID 1)

      Type-7 AS External Link States (Area 1)

Routing Bit Set on this LSA in topology Base with MTID 0
LS age: 1
Options: (No TOS-capability, Type 7/5 translation, DC, Upward)
LS Type: AS External Link
Link State ID: 192.168.20.0 (External Network Number )
Advertising Router: 192.168.3.3
LS Seq Number: 80000005
Checksum: 0x872F
Length: 36
Network Mask: /24
  Metric Type: 1 (Comparable directly to link state metric)
  MTID: 0
  Metric: 20
  Forward Address: 192.168.3.3
  External Route Tag: 0
```

```
R1#sh ip route 192.168.20.0
Routing entry for 192.168.20.0/24
  Known via "ospf 1", distance 110, metric 31, type NSSA extern 1
  Last update from 10.143.31.234 on Ethernet0/2, 00:01:27 ago
  Routing Descriptor Blocks:
  * 10.143.31.234, from 192.168.3.3, 00:01:27 ago, via Ethernet0/2
    Route metric is 31, traffic share count is 1
```

```
R2#sh ip ospf database nssa-external

      OSPF Router with ID (192.168.2.2) (Process ID 1)

      Type-7 AS External Link States (Area 1)

Routing Bit Set on this LSA in topology Base with MTID 0
LS age: 6
Options: (No TOS-capability, Type 7/5 translation, DC, Upward)
```

```
LS Type: AS External Link
Link State ID: 192.168.20.0 (External Network Number )
Advertising Router: 192.168.3.3
LS Seq Number: 80000005
Checksum: 0x872F
Length: 36
Network Mask: /24
  Metric Type: 1 (Comparable directly to link state metric)
  MTID: 0
  Metric: 20
  Forward Address: 192.168.3.3
  External Route Tag: 0
```

```
R2#sh ip route 192.168.20.0
Routing entry for 192.168.20.0/24
  Known via "ospf 1", distance 110, metric 31, type NSSA extern 1
  Last update from 10.143.31.230 on Ethernet0/0, 00:01:57 ago
  Routing Descriptor Blocks:
  * 10.143.31.230, from 192.168.3.3, 00:01:57 ago, via Ethernet0/0
    Route metric is 31, traffic share count is 1
```

注意：有关外部LSA的非零转发地址的详细信息，请参阅[OSPF转发地址的常见路由问题](#)。