

OSPF路由环路/次优路由在Cisco IOS和NXOS之间外部路由配置示例的

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简介

本文描述在连结和Cisco IOS功能之间的开放最短路径优先(OSPF)协议如何在Cisco IOS和连结操作系统(NXOS)实现。

[先决条件](#)

[要求](#)

思科建议您有OSPF协议的知识。

使用的组件

本文档中的信息基于以下软件和硬件版本：

- NXOS版本6.2(6a)
- Cisco IOS版本15.1(4)M1

背景信息

Cisco IOS设备支持RFC 1583。然而NXOS支持RFC 2328和那里是设计，此差异能创建在网络的路由环路，当有在网络时的外部OSPF路由。

重要信息

在RFC 1583和RFC 2328之间的区别，关于如何选择在多外部路由中的最佳路由，在此部分讨论。

从RFC 1583部分16.4.6提取

为了比较类型1外部路径，请查看距离的总和对转发地址和通告的类型1量度(X+Y)的。为了比较类型2外部路径，如果需要，请查看通告的类型2量度然后距离对转发地址。

如果新的路径是更短的，替换路由表条目的现在路径。如果新的路径是同一开销，被添加到路径路由表条目的列表。

注意：如果转发地址是所有零的开销，自治系统边界路由器(ASBR)用于选择最佳路由。

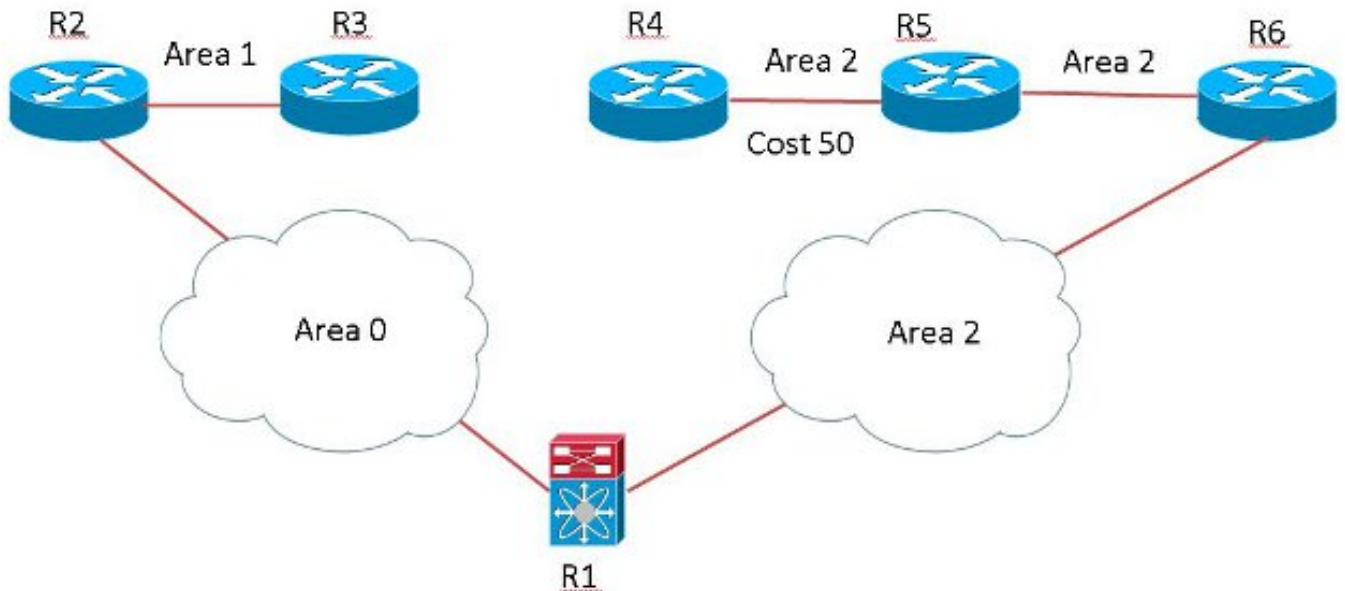
从RFC 2328部分16.4.1提取

使用非骨干区域的区域内路径总是多数首选的。其他路径，区域内骨干网路径和域间路径，是相等的首选。

配置

场景 1

网络图



R1 is running NX-OS and others are running IOS.

R3和R4重新分配与和一样OSPF外部类型E2路由的量的同一网络172.16.1.0/24。R6偏好R3通告的路由，因为对ASBR R3的向前量度更低比对R4，并且172.16.1.0/24的下一跳是R1。(根据RFC 1583，路径选择根据开销独自地。)

```
R6#sh ip ospf border-routers
```

```
OSPF Router with ID (192.168.6.6) (Process ID 1)
```

```
Base Topology (MTID 0)
```

```
Internal Router Routing Table
```

```
Codes: i - Intra-area route, I - Inter-area route
```

```
i 192.168.4.4 [51] via 192.168.56.5, GigabitEthernet0/0, ASBR, Area 2, SPF 17
>>>> Cost is 51 to reach R4 ASBR.
i 192.168.1.1 [1] via 192.168.16.1, GigabitEthernet0/1, ABR, Area 2, SPF 17
I 192.168.3.3 [42] via 192.168.16.1, GigabitEthernet0/1, ASBR, Area 2, SPF 17
>>>>Cost is 42 to reach R3 ASBR
```

```
R6#sh ip route 172.16.1.0
```

```
Routing entry for 172.16.1.0/24
```

```
Known via "ospf 1", distance 110, metric 20, type extern 2, forward metric 42
```

```
Last update from 192.168.16.1 on GigabitEthernet0/1, 00:02:13 ago
```

```
Routing Descriptor Blocks:
```

```
* 192.168.16.1, from 192.168.3.3, 00:02:13 ago, via GigabitEthernet0/1
```

```
Route metric is 20, traffic share count is 1
```

因为它是区域内路由对ASBR，R1偏好尽管较高的R4通告的路由。路由不通过骨干区域，并且下一跳是R6 (根据RFC 2328)。

```
R1-NXOS# sh ip ospf border-routers
```

```
OSPF Process ID 1 VRF default, Internal Routing Table
```

```
Codes: i - Intra-area route, I - Inter-area route
```

```
intra 192.168.2.2 [40], ABR, Area 0.0.0.0, SPF 18
```

```
via 192.168.12.2, Eth4/43
```

```
inter 192.168.3.3 [41], ASBR, Area 0.0.0.0, SPF 18 >>>> Cost is 41
```

```
via 192.168.12.2, Eth4/43
```

```
intra 192.168.4.4 [91], ASBR, Area 0.0.0.2, SPF 18 >>>> Cost is 91
```

```
via 192.168.16.6, Eth4/44
```

```
switch-R1-NXOS# sh ip route 172.16.1.0
```

```
IP Route Table for VRF "default"
```

```
'*' denotes best ucast next-hop
```

```
***' denotes best mcast next-hop
```

```
'[x/y]' denotes [preference/metric]
```

```
'%' in via output denotes VRF
```

```
172.16.1.0/24, ubest/mbest: 1/0
```

```
*via 192.168.16.6, Eth4/44, [110/20], 00:10:41, ospf-1, type-2
```

当R6发送数据包对R1和R1送回他们到R6，这的网络引起一条环路。

```
R5#traceroute 172.16.1.1 numeric
```

```
Type escape sequence to abort.
```

```
Tracing the route to 172.16.1.1
```

```
VRF info: (vrf in name/id, vrf out name/id)
```

```
1 192.168.56.6 4 msec 0 msec 0 msec
```

```
2 192.168.16.1 4 msec 0 msec 4 msec
```

```
3 192.168.16.6 0 msec 4 msec 0 msec
```

```
4 192.168.16.1 4 msec 0 msec 4 msec
```

```
5 192.168.16.6 0 msec 4 msec 0 msec
```

您看到，在R1和R6之间的信息包环路。为了解决此问题，您需要更改在NXOS的RFC兼容性。

```
R1-NXOS(config)# router ospf 1
```

```
R1-NXOS(config-router)# rfc1583compatibility
```

```
switch-R1-NXOS# sh ip route 172.16.1.0
```

```
IP Route Table for VRF "default"
```

```
'*' denotes best ucast next-hop
```

```
***' denotes best mcast next-hop
```

```
'[x/y]' denotes [preference/metric]
```

```
'%' in via output denotes VRF
```

```
172.16.1.0/24, ubest/mbest: 1/0
```

```
*via 192.168.12.2, Eth4/43, [110/20], 00:00:40, ospf-1, type-2
```

现在，R1正确指向它R2，并且环路从网络删除。

```
R5#traceroute 172.16.1.1 numeric
```

```
Type escape sequence to abort.
```

```
Tracing the route to 172.16.1.1
```

```
VRF info: (vrf in name/id, vrf out name/id)
```

```
1 192.168.56.6 0 msec 4 msec 0 msec
```

```
2 192.168.16.1 0 msec 0 msec 0 msec
```

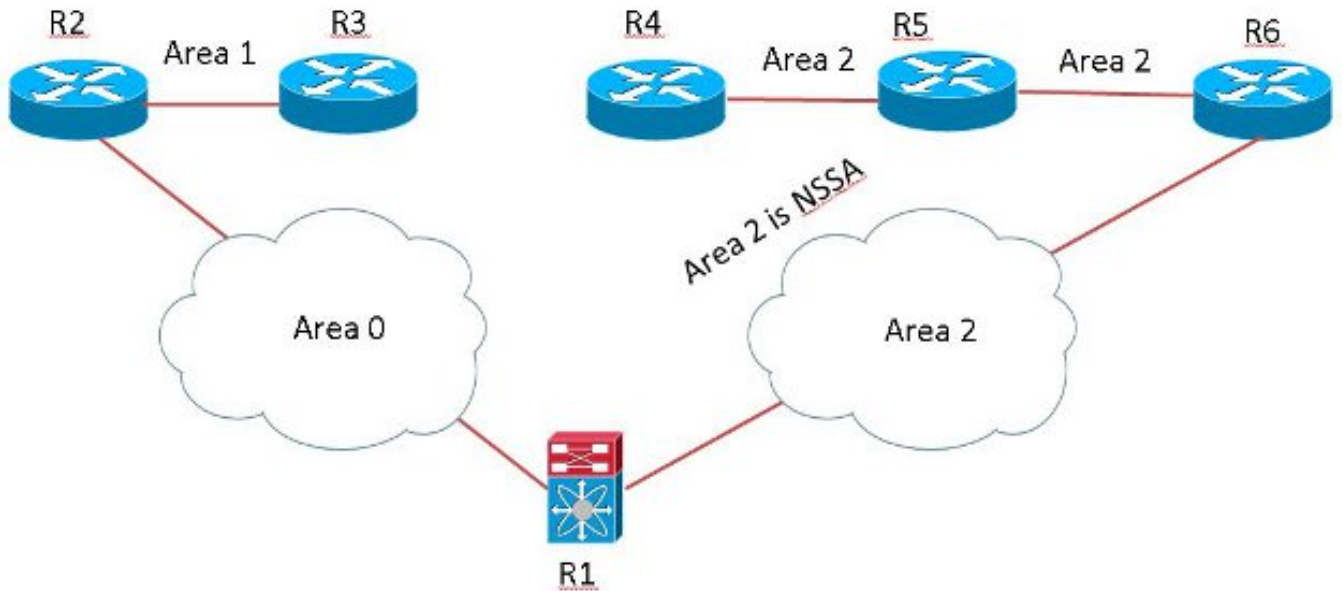
```
3 192.168.12.2 4 msec 0 msec 0 msec
```

```
4 192.168.23.3 4 msec 0 msec 4 msec
```

```
5 192.168.23.3 4 msec 0 msec 4 msec
```

场景 2

网络图



R1 is running NX-OS and others are running IOS.

R1接收nssa-external (从R6的类型7)路由和外部(从R2的类型5)路由同样的前缀172.16.1.0/24。R1更喜欢在OSPF类型5的类型7，在类型7.通常虽则更喜欢。

```
R1-NXOS# sh ip ospf database nssa-external 172.16.1.0 detail
OSPF Router with ID (192.168.1.1) (Process ID 1 VRF default)
```

```
Type-7 AS External Link States (Area 0.0.0.2)
```

```
LS age: 914
Options: 0x28 (No TOS-capability, Type 7/5 translation, DC)
LS Type: Type-7 AS-External
Link State ID: 172.16.1.0 (Network address)
Advertising Router: 192.168.4.4 >>>> Type 7 originated by R4
```

and installed in the RIB.

```
LS Seq Number: 0x80000001
Checksum: 0x3696
Length: 36
Network Mask: /24
Metric Type: 2 (Larger than any link state path)
TOS: 0
Metric: 20
Forward Address: 192.168.45.4
External Route Tag: 0>
```

```
R1-NXOS# sh ip ospf database external 172.16.1.0 detail
OSPF Router with ID (192.168.1.1) (Process ID 1 VRF default)
```

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

```
LS age: 853
Options: 0x2 (No TOS-capability, No DC)
LS Type: Type-5 AS-External
Link State ID: 172.16.1.0 (Network address)
Advertising Router: 192.168.1.1 >>>> Since Type 7 is installed
```

in the RIB, it was converted to type 5

```
LS Seq Number: 0x80000001
Checksum: 0xb545
Length: 36
```

```

Network Mask: /24
  Metric Type: 2 (Larger than any link state path)
  TOS: 0<
  Metric: 20
  Forward Address: 192.168.45.4
  External Route Tag: 0<

LS age: 596
Options: 0x20 (No TOS-capability, DC)
LS Type: Type-5 AS-External
Link State ID: 172.16.1.0 (Network address)
Advertising Router: 192.168.3.3          >>>>>>  Type 5 is also received from R3
  LS Seq Number: 0x80000002
Checksum: 0x2250
Length: 36
Network Mask: /24
  Metric Type: 2 (Larger than any link state path)>
  TOS: 0
  Metric: 20<>
  Forward Address: 0.0.0.0
  External Route Tag: 0

```

```

R1-NXOS# sh ip route 172.16.1.0
IP Route Table for VRF "default"
 '*' denotes best ucast next-hop
 '**' denotes best mcast next-hop
 '[x/y]' denotes [preference/metric]
 '%<string>' in via output denotes VRF <string>

```

```

172.16.1.0/24, ubest/mbest: 1/0
  *via 192.168.16.6, Eth4/44, [110/20], 00:16:54, ospf-1, nssa type-2    >>>> Type 7
route is installed in RIB.

```

因为R1没有rfc1583compatibility命令配置在OSPF路由器进程下，并且路由的类型5林克状态广告的(LSA)副词路由器id是可及的在area 0 (骨干网路由器)，OSPF通过非骨干区域总是选择路由的路径。在这种情况下下一跳在区域2选择(根据RFC 2328)。

```

R1-NXOS(config)# router ospf 1
R1-NXOS(config-router)# rfc1583compatibility

```

```

R1-NXOS# sh ip route 172.16.1.0
IP Route Table for VRF "default"
 '*' denotes best ucast next-hop
 '**' denotes best mcast next-hop
 '[x/y]' denotes [preference/metric]
 '%<string>' in via output denotes VRF <string>

```

```

172.16.1.0/24, ubest/mbest: 1/0
  *via 192.168.12.2, Eth4/43, [110/20], 00:00:04, ospf-1, type-2    >>>> Type 5
route is installed in RIB.

```

建议

有其他设计或网络环境，此兼容性问题能的网络导致环路或不最理想的路由，如果网络有与OSPFv2一起运行的NXOS和Cisco IOS。

Cisco推荐使用RFC 1583兼容性in命令NXOS OSPF路由器配置模式，如果网络包括只支持RFC1583的设备，那是Cisco IOS。

验证

当前没有可用于此配置的验证过程。

故障排除

目前没有针对此配置的故障排除信息。

相关信息

- [RFC 1583](#)
- [RFC 2328](#)
- [技术支持和文档 - Cisco Systems](#)