OSPF路由循环/次优路由在Cisco IOS和NXOS之间外部路由配置示例

Contents

Introduction

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

Prerequisites

Requirements

Cisco建议您有OSPF协议知识。

Components Used

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，此区别能创建在网络的路由循环，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第16.4.6部分提取

为了比较类型1外部路径，请查看距离的总和到前转地址和做通告的类型1权值(X+Y)。 为了比较类型2外部路径，如果需要，请查看做通告的类型2权值然后距离到转发地址。

如果新的路径是更短的，替换在路由表条目的当前路径。 如果新的路径是同一费用，被添加到路径路由表条目的列表。

> **Note**:如果前转地址是所有零的费用，自治系统边界路由器(ASBR)用于选择最佳路由。

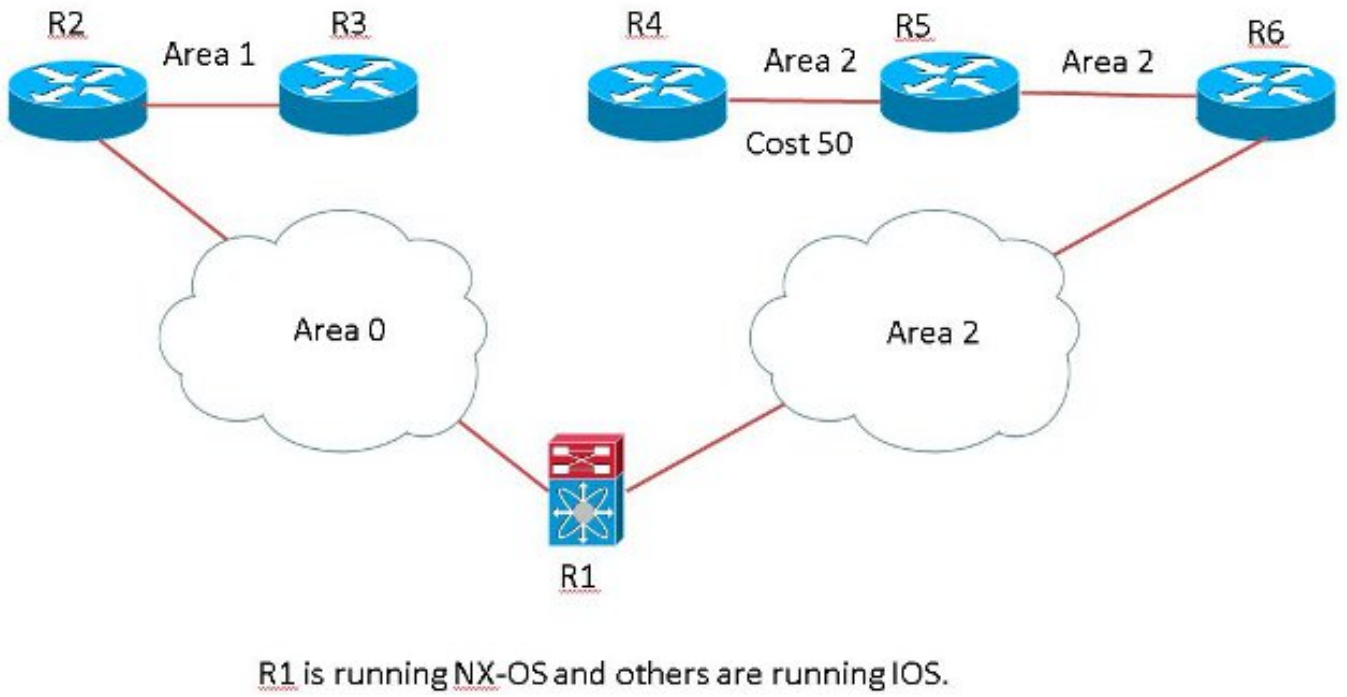
从RFC 2328第16.4.1部分提取

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

Configure

场景 1

Network Diagram



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路由的权值的同一网络172.16.1.0/24。R6偏好R3做通告的路由，因为对ASBR R3的向前权值低比对R4，并且172.16.1.0/24的下个跳跃是R1。**(根据RFC 1583，路径选择根据费用独自地。)**

```
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做通告的路由。路由不通过骨干网区域，并且下个跳跃是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发送信息包到R1和R1送回他们到R6，这的网络引起一个循环。

```
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。

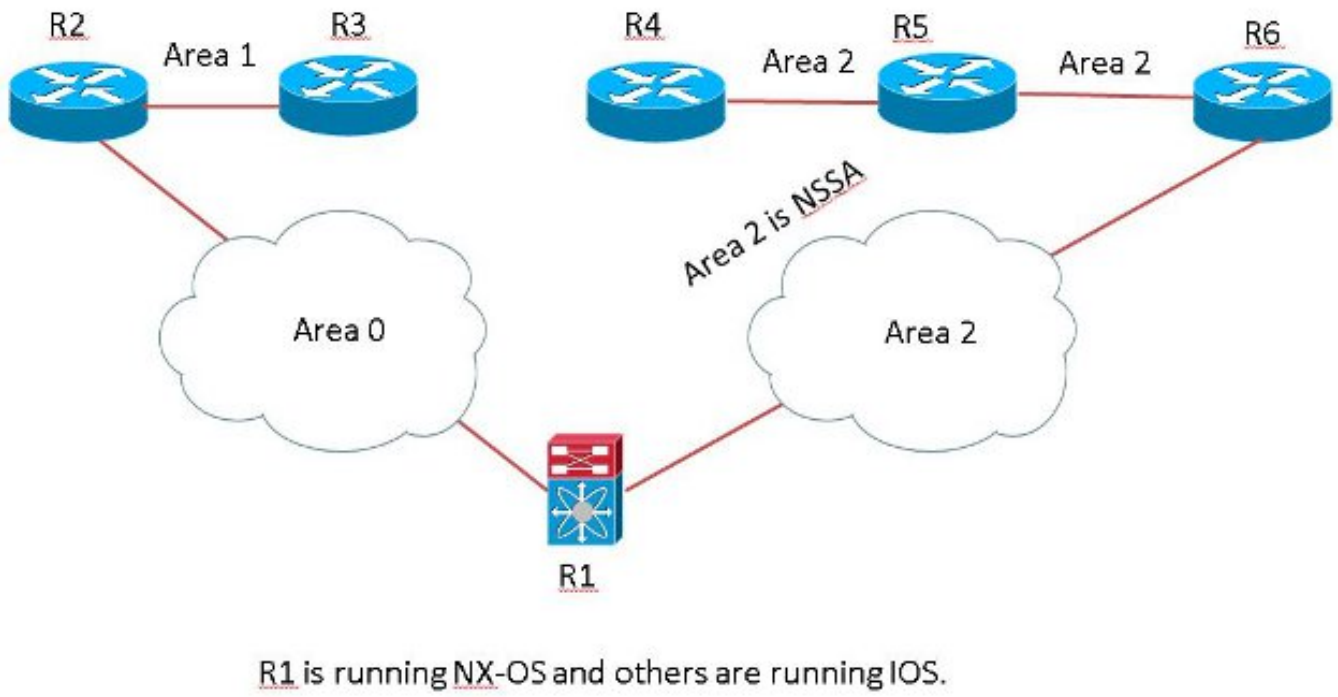
```
R1-NXOS(config)# router ospf 1
R1-NXOS(config-router)# rfc1583compatibility

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，并且循环从网络被去除。

```
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

Network Diagram



R1接受一nssa-external (类型从R6的7)路由和外部(类型从R2的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命令被配置在OSPF路由器进程下，并且路由的类型5链路状态通告的(LSA)副词路由器id是可及的在area 0 (骨干网路由器)， OSPF通过非骨干网区域总是选择路由的路径。在这种情况下下个跳跃在第2区被选择(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.
```

推荐

有其他设计或网络方案，此兼容性问题能的网络导致循环或不最理想的路由，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。

Verify

当前没有可用于此配置的验证过程。

Troubleshoot

目前没有针对此配置的故障排除信息。

Related Information

- RFC 1583
- RFC 2328
- Technical Support & Documentation - Cisco Systems