

Configurar e verificar a seleção de caminho BGP no IOS-XR

Contents

[Introduction](#)

[Informações de Apoio](#)

[Summary](#)

[Definir comandos de seleção de caminho em políticas de rota](#)

[1. set path-select backup 1 install](#)

[2. set path-select backup 1 advertise](#)

[3. set path-select backup 1 advertise install](#)

[4. set path-select all advertise](#)

[5. set path-select best-path](#)

[6. set path-select multipath advertise](#)

[7. set path-select backup 1 install multipath-protect](#)

[8. set path-select backup 1 install multipath-protect advertise](#)

[9. set path-select group-best advertise](#)

[10. set path-select backup 1 install multipath-protect advertise multipath-protect-advertise](#)

[11. set path-select multipath advertise multipath-protect](#)

[12. set path-select multipath advertise multipath-protect multipath-protect-advertise](#)

[Novo comportamento de seleção de caminho a partir do Cisco IOS®-XR 7.3.1](#)

[A seleção de caminho por vizinho é possível](#)

[Instruções de seleção de caminho de vários conjuntos são permitidas em uma política de rota](#)

[Mostrar os caminhos do BGP na ordem em que são recebidos](#)

[Caminho de backup versus backup \(proteger multipath\)](#)

[Pedido por Métrica IGP](#)

Introduction

Este documento descreve a instrução **set path-select** em uma política de rota para o Border Gateway Protocol (BGP) no Cisco IOS®-XR.

Informações de Apoio

Muitos designs pretendem que o BGP selecione e anuncie vários caminhos para um prefixo.

Por padrão, apenas um caminho BGP é selecionado como o melhor caminho e apenas esse melhor caminho é anunciado. O algoritmo de seleção de melhor caminho do BGP decide isso:

[Algoritmo de seleção de melhor caminho BGP](#)

Além do melhor caminho, um segundo melhor caminho pode ser escolhido como um caminho de backup. Esse caminho de backup pode ser usado em designs com BGP PIC (convergência

independente de prefixo).

O BGP pode instalar vários caminhos para alcançar o balanceamento de carga. Isso pode ser balanceamento de carga ECMP (Equal Cost Multipath) ou UCMP (UnEqual Cost Multipath). Esses multipath são instalados na tabela de roteamento (RIB) e na tabela de plano de dados ou na tabela FIB (Forwarding Instance Base) para obter balanceamento de carga. A tabela FIB também é conhecida como a tabela CEF (Cisco Express Forwarding).

Este artigo enfoca dois objetivos:

- Como fazer com que o BGP escolha vários caminhos a serem instalados?
- Como fazer com que o BGP anuncie vários caminhos?

Outro recurso usado pelo BGP é Caminhos Adicionais (ADD-Paths). Esse recurso permite que o BGP anuncie mais de um caminho em uma sessão BGP.

Summary

- O melhor caminho é sempre escolhido pelo BGP. Se não, há algo errado. O presente artigo não abrange esses cenários.
- Um caminho de backup pode ser escolhido se o recurso específico estiver configurado (por exemplo, BGP PIC).
- Uma política de rota pode ser configurada em uma família de endereços específica para o BGP para selecionar os caminhos a serem instalados e/ou anunciados.
- Antes do Cisco IOS®-XR 7.3.1, há suporte para apenas uma instrução **set path-select** na política de rota para a seleção de caminhos para um prefixo específico.
- Para começar com o Cisco IOS®-XR 7.3.1, há suporte para várias instruções **de seleção de caminho do conjunto** na política de rota para a seleção de caminhos para um prefixo específico.
- Começando com o Cisco IOS®-XR 7.3.1, um recurso foi adicionado onde uma política de rota pode ser usada para anunciar caminhos específicos para um prefixo BGP para um vizinho BGP.

A seleção de caminhos multipath pelo BGP é feita para receber os caminhos. No entanto, os comandos **show bgp** mostram os caminhos BGP em ordem lexicográfica.

Um novo comando - introduzido no Cisco IOS®-XR 7.3.1- pode ser usado para ver os caminhos BGP na ordem em que foram recebidos:

```
show bgp <afi> rd <rd> <path_details>
```

Isso ajuda na verificação e na solução de problemas de multipath. Resolve a questão principal de por que um caminho é escolhido como multipath e não como outro.

Um caminho de proteção de vários caminhos é um caminho de backup que não é um caminho multipath, mas protege todos os outros caminhos multipath.

Começando com o Cisco IOS®-XR 7.3.1, há essa nova palavra-chave **multipath-protect-advertise**

para a instrução **set path-select**. Ele pode ser usado para anunciar o caminho de proteção de vários caminhos **junto ao caminho de backup** ou **junto aos caminhos de vários caminhos**. Os comandos completos a serem usados na política de rota são:

```
set path-selection backup 1 install multipath-protect advertise multipath-protect-advertise
set path-selection multipath advertise multipath-protect multipath-protect-advertise
```

Esta é uma visão geral do comando **set path-select** com todas as combinações de palavras-chave. Uma explicação mais detalhada e exemplos são encontrados na próxima seção.

Em todos os casos abaixo, o melhor caminho é instalado. Se não estiver, algo está errado (por exemplo, o próximo salto é inválido), mas isso não está relacionado ao comando **set path-select**.

Para que o caminho de backup seja selecionado, um recurso deve ser ativado para o BGP, o que permite a seleção de um caminho de backup do BGP: por exemplo, BGP PIC.

Os caminhos multipath são ativados no BGP pelo comando da família de endereços **maximum-paths**:

```
maximum-paths {ebgp | eibgp | ibgp} <2-32> (unequal-cost)
```

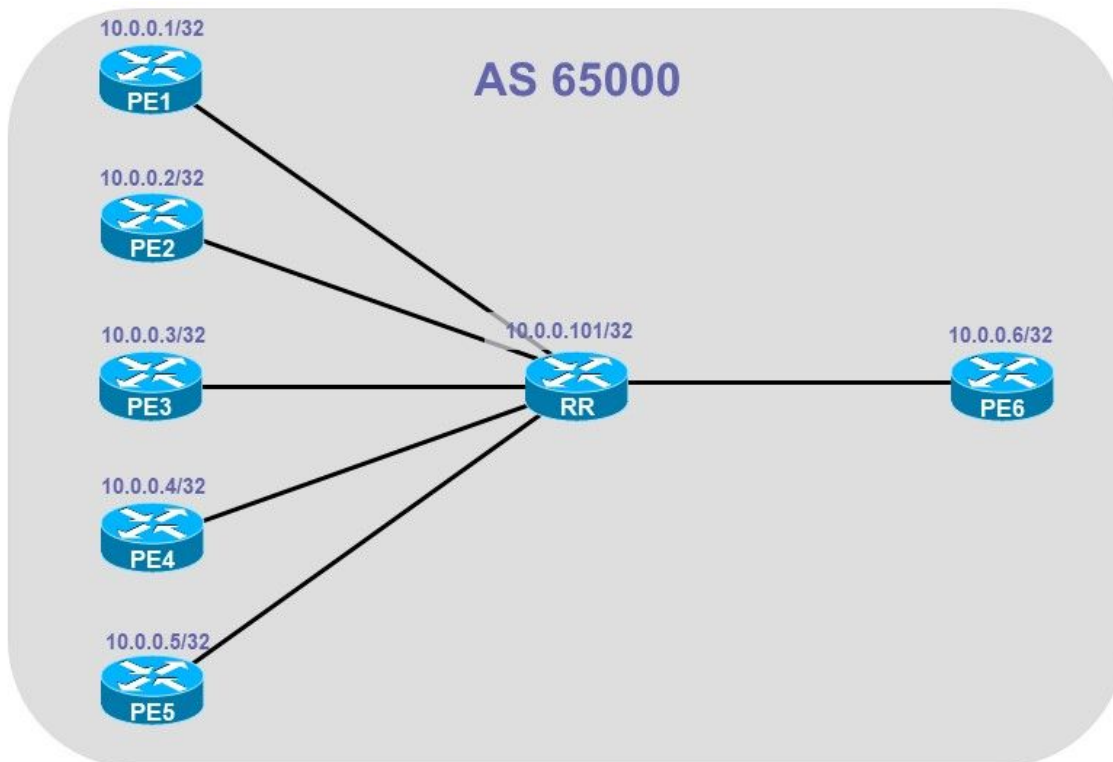
Por definição, o melhor caminho é um caminho multipath. O melhor caminho é o único caminho instalado na tabela de roteamento se o multipath para BGP não estiver habilitado. Você pode controlar quantos caminhos BGP estão instalados na tabela de roteamento com o comando **maximum-paths {ebgp | eibgp | ibgp} <2-32> (custo desigual)**.

Esta tabela fornece uma visão geral de todas as opções com o comando **set path-select**. Para obter mais detalhes e exemplos, consulte a próxima seção de cada caso apresentado aqui.

Caso	Comando	Instalação	Publicidade
1	set path-select backup 1 install	1 caminho de backup instalado.	Apenas o melhor cam é anunciado.
2	set path-select backup 1 advertise	O caminho de backup não está instalado.	O caminho de backup anunciado.
3	set path-select backup 1 advertise install	O caminho de backup está instalado.	O caminho de backup anunciado.
4	set path-select all advertise	O caminho de backup não está instalado. Os caminhos multipath estão instalados.	Todos os caminhos s anunciados (melhor caminho, caminho de backup, multipath, caminho não multipat
5	set path-select best-path	Os caminhos multipath estão instalados.	Apenas o melhor cam é anunciado.
6	set path-select multipath advertise	Os caminhos multipath estão instalados.	Os caminhos multipa anunciados.

7	<pre>set path-select backup 1 install multipath-protect</pre>	<p>Os caminhos multipath estão instalados.</p> <p>Outro caminho é instalado como um caminho de backup (o caminho "backup(protect multipath)" se ainda houver caminhos ao lado dos caminhos multipath.</p>	<p>Apenas o melhor caminho é anunciado.</p>
8	<pre>set path-select backup 1 install multipath-protect advertise</pre>	<p>Os caminhos multipath estão instalados.</p> <p>Outro caminho é instalado como um caminho de backup (o caminho "backup(protect multipath)" se ainda houver caminhos ao lado dos caminhos multipath.</p>	<p>O melhor caminho e o caminho de backup são anunciados.</p> <p>O caminho de backup (proteger multipath) não é anunciado.</p>
9	<pre>set path-select group-best advertise</pre>	<p>A melhor seleção de grupo é o melhor caminho por AS e também por próximo salto.</p> <p>Os caminhos multipath estão instalados.</p>	<p>Todos os melhores caminhos de grupo são anunciados.</p>
10	<pre>set path-select backup 1 install multipath-protect advertise multipath- protect-advertise</pre>	<p>Os caminhos multipath estão instalados.</p> <p>Outro caminho é instalado como um caminho de backup (o caminho "backup(protect multipath)" se ainda houver caminhos ao lado dos caminhos multipath.</p>	<p>O melhor caminho, o caminho de backup e o caminho de backup (proteger multipath) são anunciados.</p>
11	<pre>set path-select multipath advertise multipath-protect</pre>	<p>Os caminhos multipath estão instalados.</p>	<p>Os caminhos multipath são anunciados.</p> <p>O caminho de backup (proteger multipath) não é anunciado.</p>
12	<pre>set path-select multipath advertise multipath-protect multipath-protect-advertise</pre>	<p>Os caminhos multipath estão instalados.</p> <p>Outro caminho é instalado como um caminho de backup (o caminho "backup(protect multipath)" se ainda houver caminhos ao lado dos caminhos multipath.</p>	<p>Os caminhos multipath são anunciados.</p> <p>O caminho de backup (proteger multipath) é anunciado.</p>

Esta é a topologia usada em todo este documento.



Em todos os casos, ADD-PATH é ativado entre o RR (Route-Reflector) e o PE6.

PE1, PE2, PE3, PE4, PE5 e PE6 anunciam o mesmo prefixo da rota unicast vpnv4 para o RR.

PE6 é o PE de ingresso, que recebe esse prefixo do RR.

A menos que mencionado de outra forma, ADD-PATH é ativado em cada sessão BGP e `maximum-paths ibgp 3` é configurado no RR para `address-family vpnv4 unicast`.

Note: Há um máximo de um caminho de backup instalado nas tabelas RIB e CEF. Mais de um não é possível/suportado. O caminho é marcado como um backup na tabela BGP, na tabela RIB e na tabela CEF.

A rota de backup é sempre escolhida pelo BGP neste artigo. Uma rota de backup pode ser escolhida por outro recurso, mas aqui está sempre o BGP.

Se `multipath` estiver configurado para BGP, pode haver caminhos `multipath` (ECMP ou UCMP) instalados na tabela BGP. Eles são marcados com **multipath**. O caminho de backup é o segundo melhor caminho, portanto, deve ser um dos caminhos `multipath` se houver algum. Isso significa que pode haver um backup (`proteger multipath`) escolhido pelo BGP se esse recurso estiver configurado (a palavra-chave **multipath-protect** na instrução `set path-select route-policy`). Se esse for o caso, esse caminho **de backup (proteger multipath)** é o caminho de backup na tabela RIB e CEF. O caminho **de backup** escolhido pelo BGP e marcado como tal pelo BGP não é, então, um caminho de backup, mas apenas um caminho `multipath`.

Uma rota de backup em um RR não faz muito sentido se esse RR tiver apenas a função de um RR.

Neste artigo, supõe-se que o RR também seja um roteador PE. Nesse caso, selecionar e instalar

uma rota de backup faz sentido. A rota de backup pode ser usada para BGP PIC.

Uma rota de backup é marcada com **backup** no RIB ao especificar o prefixo específico ou com "!" se não estiver especificando o prefixo.

```
RP/0/RP0/CPU0:RR#show route vrf one 10.1.1.1/32
Routing entry for 10.1.1.1/32
  Known via "bgp 65000", distance 200, metric 0
  Number of pic paths 1 , type internal
  Installed Sep 17 13:25:25.064 for 00:03:27
  Routing Descriptor Blocks
    10.0.0.1, from 10.0.0.1, BGP multi path
      Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
      Route metric is 0
    10.0.0.2, from 10.0.0.2, BGP backup path
      Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
      Route metric is 0
    10.0.0.3, from 10.0.0.3, BGP multi path
      Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
      Route metric is 0
    10.0.0.4, from 10.0.0.4, BGP multi path
      Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
      Route metric is 0
  No advertising protos.
```

```
RP/0/RP0/CPU0:RR#show route vrf one
```

```
Codes: C - connected, S - static, R - RIP, B - BGP, (>) - Diversion path
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - ISIS, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, su - IS-IS summary null, * - candidate default
       U - per-user static route, o - ODR, L - local, G - DAGR, l - LISP
       A - access/subscriber, a - Application route
       M - mobile route, r - RPL, t - Traffic Engineering, (!) - FRR Backup path
```

Gateway of last resort is not set

```
B    10.1.1.1/32 [200/0] via 10.0.0.1 (nexthop in vrf default), 00:02:16
      [200/0] via 10.0.0.2 (nexthop in vrf default), 00:02:16 (!)
      [200/0] via 10.0.0.3 (nexthop in vrf default), 00:02:16
      [200/0] via 10.0.0.4 (nexthop in vrf default), 00:02:16
```

Definir comandos de seleção de caminho em políticas de rota

Esta seção abrange todas as instruções **set path-select** usadas na política de rota para a família de endereços específica no roteador BGP.

Isso independentemente da versão do Cisco IOS®-XR anterior ou posterior ao Cisco IOS®-XR 7.3.1.

Configuração:

```
router bgp 65000
  address-family ipv4 unicast
  !
  address-family vpv4 unicast
```

```
additional-paths receive
additional-paths send
additional-paths selection route-policy BGP-Path-Selection
!
neighbor 10.0.0.1
remote-as 65000
update-source Loopback0
address-family ipv4 unicast
  route-reflector-client
!
address-family vpnv4 unicast
  route-reflector-client
!
!
neighbor 10.0.0.2
remote-as 65000
update-source Loopback0
address-family ipv4 unicast
  route-reflector-client
!
address-family vpnv4 unicast
  route-reflector-client
!
!
neighbor 10.0.0.3
remote-as 65000
update-source Loopback0
address-family ipv4 unicast
  route-reflector-client
!
address-family vpnv4 unicast
  route-reflector-client
!
!
neighbor 10.0.0.4
remote-as 65000
update-source Loopback0
address-family ipv4 unicast
  route-reflector-client
!
address-family vpnv4 unicast
  route-reflector-client
!
!
neighbor 10.0.0.5
remote-as 65000
update-source Loopback0
address-family ipv4 unicast
  route-reflector-client
!
address-family vpnv4 unicast
  route-reflector-client
!
!
neighbor 10.0.0.6
remote-as 65000
update-source Loopback0
address-family ipv4 unicast
  route-reflector-client
!
address-family vpnv4 unicast
  route-reflector-client
!
!
```

```

vrf one
rd 1:1
address-family ipv4 unicast
  maximum-paths ibgp 3
  additional-paths selection route-policy BGP-Path-Selection
redistribute connected
!
!
!

```

A política de rota com as instruções `set path-select` é aplicada sob o `unicast address-family vpv4`.

A política de rota com as instruções `set path-select` também é aplicada ao VRF. Isso é necessário se uma rota de backup precisa ser instalada na tabela RIB/CEF do VRF (ou anunciada sobre a sessão BGP pelo link PE-CE).

Aqui, ambas as políticas de rota são as mesmas, mas diferentes podem ser aplicadas sob a família de endereços versus sob o VRF.

O caminho máximo `ibgp 3` é usado em VRF um, especificando que pode haver até três caminhos ECMP na tabela RIB/CEF.

Esses casos mostram todas as possibilidades para a política de rota com `set path-select`.

1. set path-select backup 1 install

```

route-policy BGP-Path-Selection
  set path-selection backup 1 install
end-policy
!

```

```
RP/0/RP0/CPU0:RR#show bgp vpv4 unicast rd 1:1 10.1.1.1/32
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```

Process          bRIB/RIB  SendTblVer
Speaker          5         5

```

```
Last Modified: Sep 17 13:14:35.907 for 00:04:41
```

```
Paths: (5 available, best #1)
```

```
Advertised to update-groups (with more than one peer):
```

```
0.2 0.3
```

```
Path #1: Received by speaker 0
```

```
Advertised to update-groups (with more than one peer):
```

```
0.2 0.3
```

```
Local, (Received from a RR-client)
```

```
10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
```

```
import-candidate, imported
```

```
Received Path ID 0, Local Path ID 1, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VpNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #2: Received by speaker 0
```

```
Not advertised to any peer
```

```
Local, (Received from a RR-client)
```

```
10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
```



```

import-candidate, imported
  Received Path ID 0, Local Path ID 2, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #3: Received by speaker 0
Not advertised to any peer
Local, (Received from a RR-client)
  10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
  Received Path ID 0, Local Path ID 0, version 0
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Not advertised to any peer
Local, (Received from a RR-client)
  10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
  Received Label 24013
  Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
  Received Path ID 0, Local Path ID 0, version 0
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Not advertised to any peer
Local, (Received from a RR-client)
  10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
  Received Label 24014
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, import-candidate,
imported
  Received Path ID 1, Local Path ID 0, version 0
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:

```

RP/0/RP0/CPU0:RR#**show route vrf one 10.1.1.1/32**

```

Routing entry for 10.1.1.1/32
Known via "bgp 65000", distance 200, metric 0
Number of pic paths 1 , type internal
Installed Sep 17 13:25:25.064 for 00:03:27
Routing Descriptor Blocks
  10.0.0.1, from 10.0.0.1, BGP multi path
    Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
    Route metric is 0
  10.0.0.2, from 10.0.0.2, BGP backup path
    Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
    Route metric is 0
  10.0.0.3, from 10.0.0.3, BGP multi path
    Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
    Route metric is 0
  10.0.0.4, from 10.0.0.4, BGP multi path
    Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
    Route metric is 0
No advertising protos.

```

RP/0/RP0/CPU0:RR#**show cef vrf one 10.1.1.1/32**

```

10.1.1.1/32, version 119, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08
(0xf4e10a8)
Updated Sep 17 13:25:25.068
Prefix Len 32, traffic index 0, precedence n/a, priority 3
via 10.0.0.1/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 0 NHID 0x0 [0xdab2bc0 0x0], Internal 0xd6a2730
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.1/32 via 24003/0/21

```

```

next hop 10.1.101.1/32 Gi0/0/0/0    labels imposed {ImplNull 24012}
via 10.0.0.2/32, 2 dependencies, recursive, backup [flags 0x6100]
path-idx 1 NHID 0x0 [0xdab2e48 0x0]
recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.2/32 via 24001/0/21
  next hop 10.2.101.2/32 Gi0/0/0/4    labels imposed {ImplNull 24012}
via 10.0.0.3/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
path-idx 2 NHID 0x0 [0xdab2060 0x0], Internal 0xd6a2550
recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.3/32 via 24007/0/21
  next hop 10.3.101.3/32 Gi0/0/0/6    labels imposed {ImplNull 24012}
via 10.0.0.4/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
path-idx 3 NHID 0x0 [0xdab2c98 0x0], Internal 0xd6a2190
recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.4/32 via 24000/0/21
  next hop 10.4.101.4/32 Gi0/0/0/7    labels imposed {ImplNull 24013}

```

Verifique os caminhos anunciados:

```

RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:
Process          bRIB/RIB  SendTblVer
Speaker          87        87
Last Modified: Sep 17 13:50:32.649 for 00:00:42
Paths: (1 available, best #1)
Not advertised to any peer
Path #1: Received by speaker 0
Not advertised to any peer
Local
  10.0.0.1 (metric 3) from 10.0.0.101 (10.0.0.1)
    Received Label 24012
    Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-
candidate, imported
    Received Path ID 1, Local Path ID 1, version 87
    Extended community: RT:65000:1
    Originator: 10.0.0.1, Cluster list: 10.0.0.101
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

Conclusão: Há um caminho de backup instalado no RR no VRF. Apenas o melhor caminho é anunciado.

2. set path-select backup 1 advertise

```

route-policy BGP-Path-Selection
  set path-selection backup 1 advertise
end-policy
!

```

```

RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:
Process          bRIB/RIB  SendTblVer
Speaker          5         5
Last Modified: Sep 17 13:38:03.907 for 00:02:04
Paths: (5 available, best #1)
Advertised to update-groups (with more than one peer):
  0.2 0.3

```

Path #1: Received by speaker 0
 Advertised to update-groups (with more than one peer):
 0.2 0.3
 Local, (Received from a RR-client)
 10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
 Received Label 24012
 Origin incomplete, metric 0, localpref 100, valid, internal, **best**, group-best, **multipath**,
 import-candidate, imported
 Received Path ID 0, Local Path ID 1, version 5
 Extended community: RT:65000:1
 Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #2: Received by speaker 0
 Advertised to update-groups (with more than one peer):
 0.3
 Local, (Received from a RR-client)
 10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
 Received Label 24012
 Origin incomplete, metric 0, localpref 100, valid, internal, **multipath**, **backup**, add-path,
 import-candidate, imported
 Received Path ID 0, Local Path ID 2, version 5
 Extended community: RT:65000:1
 Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #3: Received by speaker 0
 Not advertised to any peer
 Local, (Received from a RR-client)
 10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
 Received Label 24012
 Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
 Received Path ID 0, Local Path ID 0, version 0
 Extended community: RT:65000:1
 Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #4: Received by speaker 0
 Not advertised to any peer
 Local, (Received from a RR-client)
 10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
 Received Label 24013
 Origin incomplete, metric 0, localpref 100, valid, internal, **multipath**, import-candidate,
 imported
 Received Path ID 0, Local Path ID 0, version 0
 Extended community: RT:65000:1
 Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #5: Received by speaker 0
 Not advertised to any peer
 Local, (Received from a RR-client)
 10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
 Received Label 24014
 Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
 Received Path ID 1, Local Path ID 0, version 0
 Extended community: RT:65000:1
 Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

RP/0/RP0/CPU0:RR#show route vrf one 10.1.1.1/32

Routing entry for 10.1.1.1/32

Known via "bgp 65000", distance 200, metric 0, type internal

Installed Sep 17 13:38:04.233 for 00:04:26

Routing Descriptor Blocks

10.0.0.1, from 10.0.0.1, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.2, from 10.0.0.2, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.4, from 10.0.0.4, **BGP multi path**

```
Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
Route metric is 0
No advertising protos.
```

```
RP/0/RP0/CPU0:RR#show cef vrf one 10.1.1.1/32
```

```
10.1.1.1/32, version 135, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08 (0xf696158)
```

```
Updated Sep 17 13:38:04.236
```

```
Prefix Len 32, traffic index 0, precedence n/a, priority 3
via 10.0.0.1/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 0 NHID 0x0 [0xdab2bc0 0x0]
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.1/32 via 24003/0/21
    next hop 10.1.101.1/32 Gi0/0/0/0 labels imposed {ImplNull 24012}
via 10.0.0.2/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 1 NHID 0x0 [0xdab2e48 0x0]
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.2/32 via 24001/0/21
    next hop 10.2.101.2/32 Gi0/0/0/4 labels imposed {ImplNull 24012}
via 10.0.0.4/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 2 NHID 0x0 [0xdab2c98 0x0]
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.4/32 via 24000/0/21
    next hop 10.4.101.4/32 Gi0/0/0/7 labels imposed {ImplNull 24013}
```

Verifique os caminhos anunciados:

```
RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```
Process          bRIB/RIB  SendTblVer
Speaker          73        73
```

```
Last Modified: Sep 17 13:38:05.649 for 00:02:47
```

```
Paths: (2 available, best #1)
```

```
Not advertised to any peer
```

```
Path #1: Received by speaker 0
```

```
Not advertised to any peer
```

```
Local
```

```
10.0.0.1 (metric 3) from 10.0.0.101 (10.0.0.1)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-candidate, imported
```

```
Received Path ID 1, Local Path ID 1, version 73
```

```
Extended community: RT:65000:1
```

```
Originator: 10.0.0.1, Cluster list: 10.0.0.101
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #2: Received by speaker 0
```

```
Not advertised to any peer
```

```
Local
```

```
10.0.0.2 (metric 3) from 10.0.0.101 (10.0.0.2)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
```

```
Received Path ID 2, Local Path ID 0, version 0
```

```
Extended community: RT:65000:1
```

```
Originator: 10.0.0.2, Cluster list: 10.0.0.101
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

Conclusão: A rota de backup não está instalada. O caminho de backup é anunciado.

3. set path-select backup 1 advertise install

```
route-policy BGP-Path-Selection
  set path-selection backup 1 advertise install
end-policy
!
```

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```
Process          bRIB/RIB  SendTblVer
Speaker          5         5
```

```
Last Modified: Sep 17 14:20:36.907 for 00:01:55
```

```
Paths: (5 available, best #1)
```

```
Advertised to update-groups (with more than one peer):
 0.2 0.3
```

```
Path #1: Received by speaker 0
```

```
Advertised to update-groups (with more than one peer):
 0.2 0.3
```

```
Local, (Received from a RR-client)
```

```
10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
```

```
import-candidate, imported
```

```
Received Path ID 0, Local Path ID 1, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #2: Received by speaker 0
```

```
Advertised to update-groups (with more than one peer):
 0.3
```

```
Local, (Received from a RR-client)
```

```
10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
```

```
import-candidate, imported
```

```
Received Path ID 0, Local Path ID 2, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #3: Received by speaker 0
```

```
Not advertised to any peer
```

```
Local, (Received from a RR-client)
```

```
10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
```

```
Received Path ID 0, Local Path ID 0, version 0
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #4: Received by speaker 0
```

```
Not advertised to any peer
```

```
Local, (Received from a RR-client)
```

```
10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
```

```
Received Label 24013
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
```

```
Received Path ID 0, Local Path ID 0, version 0
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #5: Received by speaker 0
```

```
Not advertised to any peer
```

```
Local, (Received from a RR-client)
```

```
10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
```

Received Label 24014
Origin incomplete, metric 0, localpref 100, valid, internal, **multipath**, import-candidate,
imported
Received Path ID 1, Local Path ID 0, version 0
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

RP/0/RP0/CPU0:RR#**show route vrf one 10.1.1.1/32**

Routing entry for 10.1.1.1/32
Known via "bgp 65000", distance 200, metric 0
Number of pic paths 1 , type internal
Installed Sep 17 14:23:42.997 for 00:00:59
Routing Descriptor Blocks
10.0.0.1, from 10.0.0.1, **BGP multi path**
Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
Route metric is 0
10.0.0.2, from 10.0.0.2, **BGP backup path**
Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
Route metric is 0
10.0.0.3, from 10.0.0.3, **BGP multi path**
Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
Route metric is 0
10.0.0.5, from 10.0.0.5, **BGP multi path**
Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
Route metric is 0
No advertising protos.

RP/0/RP0/CPU0:RR#**show cef vrf one 10.1.1.1/32**

10.1.1.1/32, version 185, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08
(0xf4e10a8)
Updated Sep 17 14:23:42.999
Prefix Len 32, traffic index 0, precedence n/a, priority 3
via 10.0.0.1/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]
path-idx 0 NHID 0x0 [0xdab2bc0 0x0], Internal 0xd6a2730
recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.1/32 via 24003/0/21
next hop 10.1.101.1/32 Gi0/0/0/0 labels imposed {ImplNull 24012}
via 10.0.0.2/32, 2 dependencies, recursive, **backup** [flags 0x6100]
path-idx 1 NHID 0x0 [0xdab2e48 0x0]
recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.2/32 via 24001/0/21
next hop 10.2.101.2/32 Gi0/0/0/4 labels imposed {ImplNull 24012}
via 10.0.0.3/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]
path-idx 2 NHID 0x0 [0xdab2060 0x0], Internal 0xd6a2550
recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.3/32 via 24007/0/21
next hop 10.3.101.3/32 Gi0/0/0/6 labels imposed {ImplNull 24012}
via 10.0.0.5/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]
path-idx 3 NHID 0x0 [0xdab2368 0x0], Internal 0xd6a2190
recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.5/32 via 24005/0/21
next hop 10.5.101.5/32 Gi0/0/0/1 labels imposed {ImplNull 24014}

Verifique os caminhos anunciados:

RP/0/RP0/CPU0:PE6#**show bgp vpnv4 unicast rd 1:1 10.1.1.1/32**

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:

```

Process          bRIB/RIB  SendTblVer
Speaker          105      105
Last Modified:  Sep 17 14:23:43.649 for 00:02:16
Paths: (2 available, best #1)
Not advertised to any peer
Path #1: Received by speaker 0
Not advertised to any peer
Local
  10.0.0.1 (metric 3) from 10.0.0.101 (10.0.0.1)
    Received Label 24012
    Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-
candidate, imported
    Received Path ID 1, Local Path ID 1, version 105
    Extended community: RT:65000:1
    Originator: 10.0.0.1, Cluster list: 10.0.0.101
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #2: Received by speaker 0
Not advertised to any peer
Local
  10.0.0.2 (metric 3) from 10.0.0.101 (10.0.0.2)
    Received Label 24012
    Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
    Received Path ID 2, Local Path ID 0, version 0
    Extended community: RT:65000:1
    Originator: 10.0.0.2, Cluster list: 10.0.0.101
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

Conclusão: A rota de backup está instalada. O caminho de backup é anunciado. Então isto é 1. e 2.

4. set path-select all advertise

```

route-policy BGP-Path-Selection
  set path-selection all advertise
end-policy
!

```

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1

Versions:

```

Process          bRIB/RIB  SendTblVer
Speaker          5         5
Last Modified:  Sep 17 14:28:58.907 for 00:04:04
Paths: (5 available, best #1)
Advertised to update-groups (with more than one peer):
  0.2 0.3
Path #1: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.2 0.3
Local, (Received from a RR-client)
  10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
    Received Label 24012
    Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
    Received Path ID 0, Local Path ID 1, version 5
    Extended community: RT:65000:1
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #2: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.2
Local, (Received from a RR-client)

```

```
10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
  Received Path ID 0, Local Path ID 4, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #3: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.2
Local, (Received from a RR-client)
10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, add-path, import-candidate,
imported
  Received Path ID 0, Local Path ID 2, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.2
Local, (Received from a RR-client)
10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
  Received Label 24013
  Origin incomplete, metric 0, localpref 100, valid, internal, add-path, import-candidate,
imported
  Received Path ID 0, Local Path ID 3, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.2
Local, (Received from a RR-client)
10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
  Received Label 24014
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
  Received Path ID 1, Local Path ID 5, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

RP/0/RP0/CPU0:RR#**show route vrf one 10.1.1.1/32**

Routing entry for 10.1.1.1/32

Known via "bgp 65000", distance 200, metric 0, type internal

Installed Sep 17 14:28:59.169 for 00:04:52

Routing Descriptor Blocks

10.0.0.1, from 10.0.0.1, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.2, from 10.0.0.2, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.5, from 10.0.0.5, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

No advertising protos.

RP/0/RP0/CPU0:RR#**show cef vrf one 10.1.1.1/32**

10.1.1.1/32, version 201, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08 (0xf696158)

Updated Sep 17 14:28:59.175

Prefix Len 32, traffic index 0, precedence n/a, priority 3

via 10.0.0.1/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]


```

path-idx 0 NHID 0x0 [0xdab2bc0 0x0]
recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.1/32 via 24003/0/21
  next hop 10.1.101.1/32 Gi0/0/0/0    labels imposed {ImplNull 24012}
via 10.0.0.2/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
path-idx 1 NHID 0x0 [0xdab2e48 0x0]
recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.2/32 via 24001/0/21
  next hop 10.2.101.2/32 Gi0/0/0/4    labels imposed {ImplNull 24012}
via 10.0.0.5/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
path-idx 2 NHID 0x0 [0xdab2368 0x0]
recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.5/32 via 24005/0/21
  next hop 10.5.101.5/32 Gi0/0/0/1    labels imposed {ImplNull 24014}

```

Verifique os caminhos anunciados:

```
RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1

Versions:

Process	BRIB/RIB	SendTblVer
Speaker	125	125

Last Modified: Sep 17 14:29:00.649 for 00:02:21

Paths: (5 available, best #1)

Not advertised to any peer

Path #1: Received by speaker 0

Not advertised to any peer

Local

10.0.0.1 (metric 3) from 10.0.0.101 (10.0.0.1)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-candidate, imported

Received Path ID 1, Local Path ID 1, version 125

Extended community: RT:65000:1

Originator: 10.0.0.1, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #2: Received by speaker 0

Not advertised to any peer

Local

10.0.0.3 (metric 3) from 10.0.0.101 (10.0.0.3)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 2, Local Path ID 0, version 0

Extended community: RT:65000:1

Originator: 10.0.0.3, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #3: Received by speaker 0

Not advertised to any peer

Local

10.0.0.4 (metric 3) from 10.0.0.101 (10.0.0.4)

Received Label 24013

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 3, Local Path ID 0, version 0

Extended community: RT:65000:1

Originator: 10.0.0.4, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #4: Received by speaker 0

Not advertised to any peer

Local

```

10.0.0.2 (metric 3) from 10.0.0.101 (10.0.0.2)
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
  Received Path ID 4, Local Path ID 0, version 0
  Extended community: RT:65000:1
  Originator: 10.0.0.2, Cluster list: 10.0.0.101
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Not advertised to any peer
Local
  10.0.0.5 (metric 3) from 10.0.0.101 (10.0.0.5)
    Received Label 24014
    Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
    Received Path ID 5, Local Path ID 0, version 0
    Extended community: RT:65000:1
    Originator: 10.0.0.5, Cluster list: 10.0.0.101
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

Conclusão: A rota de backup não está instalada. Todos os (5) caminhos são anunciados.

5. set path-select best-path

```

route-policy BGP-Path-Selection
  set path-selection best-path
end-policy
!

```

```

RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32

```

```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions: Process          bRIB/RIB  SendTblVer
  Speaker              5          5
Last Modified: Sep 17 15:34:15.907 for 00:00:09
Paths: (5 available, best #1)
  Advertised to update-groups (with more than one peer):
    0.2 0.3
  Path #1: Received by speaker 0
  Advertised to update-groups (with more than one peer):
    0.2 0.3
  Local, (Received from a RR-client)
    10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
      Received Label 24012
      Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
      Received Path ID 0, Local Path ID 1, version 5
      Extended community: RT:65000:1
      Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
  Path #2: Received by speaker 0
  Not advertised to any peer
  Local, (Received from a RR-client)
    10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
      Received Label 24012
      Origin incomplete, metric 0, localpref 100, valid, internal, multipath, import-candidate,
imported
      Received Path ID 0, Local Path ID 0, version 0
      Extended community: RT:65000:1
      Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
  Path #3: Received by speaker 0
  Not advertised to any peer
  Local, (Received from a RR-client)
    10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
      Received Label 24012

```

Origin incomplete, metric 0, localpref 100, valid, internal, **multipath**, import-candidate, imported

Received Path ID 0, Local Path ID 0, version 0

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #4: Received by speaker 0

Not advertised to any peer

Local, (Received from a RR-client)

10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)

Received Label 24013

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 0, Local Path ID 0, version 0

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #5: Received by speaker 0

Not advertised to any peer

Local, (Received from a RR-client)

10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)

Received Label 24014

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 1, Local Path ID 0, version 0

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

RP/0/RP0/CPU0:RR#**show route vrf one 10.1.1.1/32**

Routing entry for 10.1.1.1/32

Known via "bgp 65000", distance 200, metric 0, type internal

Installed Sep 17 15:34:16.311 for 00:00:28

Routing Descriptor Blocks

10.0.0.1, from 10.0.0.1, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.2, from 10.0.0.2, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.3, from 10.0.0.3, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

No advertising protos.

RP/0/RP0/CPU0:RR#**show cef vrf one 10.1.1.1/32**

10.1.1.1/32, version 215, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08 (0xf696100)

Updated Sep 17 15:34:16.313

Prefix Len 32, traffic index 0, precedence n/a, priority 3

via 10.0.0.1/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]

path-idx 0 NHID 0x0 [0xdab2bc0 0x0]

recursion-via-/32

next hop VRF - 'default', table - 0xe0000000

next hop 10.0.0.1/32 via 24003/0/21

next hop 10.1.101.1/32 Gi0/0/0/0 labels imposed {ImplNull 24012}

via 10.0.0.2/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]

path-idx 1 NHID 0x0 [0xdab2e48 0x0]

recursion-via-/32

next hop VRF - 'default', table - 0xe0000000

next hop 10.0.0.2/32 via 24001/0/21

next hop 10.2.101.2/32 Gi0/0/0/4 labels imposed {ImplNull 24012}

via 10.0.0.3/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]

path-idx 2 NHID 0x0 [0xdab2060 0x0]

recursion-via-/32

next hop VRF - 'default', table - 0xe0000000

next hop 10.0.0.3/32 via 24007/0/21

next hop 10.3.101.3/32 Gi0/0/0/6 labels imposed {ImplNull 24012}

Conclusão: Somente o melhor caminho e os caminhos multipath estão instalados. Apenas o melhor caminho é anunciado. Não há caminho de backup selecionado, instalado ou anunciado.

6. set path-select multipath advertise

Anunciar é uma palavra-chave obrigatória.

```
route-policy BGP-Path-Selection
  set path-selection multipath advertise
end-policy
```

Para que isso funcione, deve haver multipath ativado para o BGP para a família de endereços específica.

Aqui, o multipath para unicast ipv4 no VRF um está ativado.

```
router bgp 65000
  vrf one
  rd 1:1
  address-family ipv4 unicast
    maximum-paths ibgp 3
    additional-paths selection route-policy BGP-Path-Selection
  redistribute connected
```

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1

Versions:

Process	bRIB/RIB	SendTblVer
Speaker	5	5

Last Modified: Sep 17 15:40:15.907 for 00:00:28

Paths: (5 available, best #1)

Advertised to update-groups (with more than one peer):

0.2 0.3

Path #1: Received by speaker 0

Advertised to update-groups (with more than one peer):

0.2 0.3

Local, (Received from a RR-client)

10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, **best**, group-best, **multipath**,

import-candidate, imported

Received Path ID 0, Local Path ID 1, version 5

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #2: Received by speaker 0

Advertised to update-groups (with more than one peer):

0.3

Local, (Received from a RR-client)

10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, **multipath**, add-path, import-

candidate, imported

Received Path ID 0, Local Path ID 3, version 5

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #3: Received by speaker 0

Not advertised to any peer

Local, (Received from a RR-client)

```

10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
  Received Path ID 0, Local Path ID 0, version 0
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.3
Local, (Received from a RR-client)
  10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
  Received Label 24013
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
  Received Path ID 0, Local Path ID 2, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Not advertised to any peer
Local, (Received from a RR-client)
  10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
  Received Label 24014
  Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
  Received Path ID 1, Local Path ID 0, version 0
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

RP/0/RP0/CPU0:RR#**show route vrf one 10.1.1.1/32**

Routing entry for 10.1.1.1/32

Known via "bgp 65000", distance 200, metric 0, type internal

Installed Sep 17 15:40:16.152 for 00:01:11

Routing Descriptor Blocks

10.0.0.1, from 10.0.0.1, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.2, from 10.0.0.2, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.4, from 10.0.0.4, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

No advertising protos.

RP/0/RP0/CPU0:RR#**show cef vrf one 10.1.1.1/32**

10.1.1.1/32, version 229, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08 (0xf6961b0)

Updated Sep 17 15:40:16.156

Prefix Len 32, traffic index 0, precedence n/a, priority 3

via 10.0.0.1/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]

path-idx 0 NHID 0x0 [0xdab2bc0 0x0]

recursion-via-/32

next hop VRF - 'default', table - 0xe0000000

next hop 10.0.0.1/32 via 24003/0/21

next hop 10.1.101.1/32 Gi0/0/0/0 labels imposed {ImplNull 24012}

via 10.0.0.2/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]

path-idx 1 NHID 0x0 [0xdab2e48 0x0]

recursion-via-/32

next hop VRF - 'default', table - 0xe0000000

next hop 10.0.0.2/32 via 24001/0/21

next hop 10.2.101.2/32 Gi0/0/0/4 labels imposed {ImplNull 24012}

via 10.0.0.4/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]

path-idx 2 NHID 0x0 [0xdab2c98 0x0]

recursion-via-/32

```
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.4/32 via 24000/0/21
next hop 10.4.101.4/32 Gi0/0/0/7 labels imposed {ImplNull 24013}
```

Verifique os caminhos anunciados:

```
RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1

Versions:

```
Process          bRIB/RIB  SendTblVer
Speaker          153      153
```

Last Modified: Sep 17 15:40:17.649 for 00:02:08

Paths: (3 available, best #1)

Not advertised to any peer

Path #1: Received by speaker 0

Not advertised to any peer

Local

10.0.0.1 (metric 3) from 10.0.0.101 (10.0.0.1)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-candidate, imported

Received Path ID 1, Local Path ID 1, version 153

Extended community: RT:65000:1

Originator: 10.0.0.1, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #2: Received by speaker 0

Not advertised to any peer

Local

10.0.0.4 (metric 3) from 10.0.0.101 (10.0.0.4)

Received Label 24013

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 2, Local Path ID 0, version 0

Extended community: RT:65000:1

Originator: 10.0.0.4, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #3: Received by speaker 0

Not advertised to any peer

Local

10.0.0.2 (metric 3) from 10.0.0.101 (10.0.0.2)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 3, Local Path ID 0, version 0

Extended community: RT:65000:1

Originator: 10.0.0.2, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

- Os caminhos de vpnv4 são marcados com multipath.
- Os 3 caminhos multipath estão instalados no RIB.
- Os 3 caminhos multipath são anunciados.
- Não há caminho de backup.

Conclusão: Os caminhos multipath são instalados no RIB e anunciados. Não há backup selecionado, instalado ou anunciado.

7. set path-select backup 1 install multipath-protect

```
route-policy BGP-Path-Selection
```

```
set path-selection backup 1 install multipath-protect
```

```
end-policy
```

RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1

Versions:

Process	bRIB/RIB	SendTblVer
Speaker	5	5

Last Modified: Sep 17 15:46:17.907 for 00:04:59

Paths: (5 available, best #1)

Advertised to update-groups (with more than one peer):

0.2 0.3

Path #1: Received by speaker 0

Advertised to update-groups (with more than one peer):

0.2 0.3

Local, (Received from a RR-client)

10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, **best**, group-best, **multipath**, import-candidate, imported

Received Path ID 0, Local Path ID 1, version 5

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #2: Received by speaker 0

Not advertised to any peer

Local, (Received from a RR-client)

10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, **multipath**, **backup**, add-path, import-candidate, imported

Received Path ID 0, Local Path ID 2, version 5

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #3: Received by speaker 0

Not advertised to any peer

Local, (Received from a RR-client)

10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, **backup(protect multipath)**, add-path, import-candidate, imported

Received Path ID 0, Local Path ID 3, version 5

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #4: Received by speaker 0

Not advertised to any peer

Local, (Received from a RR-client)

10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)

Received Label 24013

Origin incomplete, metric 0, localpref 100, valid, internal, **multipath**, import-candidate, imported

Received Path ID 0, Local Path ID 0, version 0

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #5: Received by speaker 0

Not advertised to any peer

Local, (Received from a RR-client)

10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)

Received Label 24014

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 1, Local Path ID 0, version 0

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

RP/0/RP0/CPU0:RR#show route vrf one 10.1.1.1/32

```

Routing entry for 10.1.1.1/32
Known via "bgp 65000", distance 200, metric 0
Number of pic paths 1 , type internal
Installed Sep 17 15:46:17.904 for 00:05:14
Routing Descriptor Blocks
 10.0.0.1, from 10.0.0.1, BGP multi path
   Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
   Route metric is 0
 10.0.0.2, from 10.0.0.2, BGP multi path
   Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
   Route metric is 0
 10.0.0.3, from 10.0.0.3, BGP backup path
   Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
   Route metric is 0
 10.0.0.4, from 10.0.0.4, BGP multi path
   Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
   Route metric is 0
No advertising protos.

```

RP/0/RP0/CPU0:RR#show cef vrf one 10.1.1.1/32

```

10.1.1.1/32, version 249, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08
(0xf4e10a8)

```

Updated Sep 17 15:46:17.907

```

Prefix Len 32, traffic index 0, precedence n/a, priority 3
via 10.0.0.1/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 0 NHID 0x0 [0xdab2bc0 0x0], Internal 0xd6a2190
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.1/32 via 24003/0/21
    next hop 10.1.101.1/32 Gi0/0/0/0 labels imposed {ImplNull 24012}
via 10.0.0.2/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 1 NHID 0x0 [0xdab2e48 0x0], Internal 0xd6a2550
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.2/32 via 24001/0/21
    next hop 10.2.101.2/32 Gi0/0/0/4 labels imposed {ImplNull 24012}
via 10.0.0.3/32, 2 dependencies, recursive, backup [flags 0x6100]
  path-idx 2 NHID 0x0 [0xdab2060 0x0]
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.3/32 via 24007/0/21
    next hop 10.3.101.3/32 Gi0/0/0/6 labels imposed {ImplNull 24012}
via 10.0.0.4/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 3 NHID 0x0 [0xdab2c98 0x0], Internal 0xd6a2730
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.4/32 via 24000/0/21
    next hop 10.4.101.4/32 Gi0/0/0/7 labels imposed {ImplNull 24013}

```

Verifique os caminhos anunciados:

RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1

Versions:

```

Process          bRIB/RIB  SendTblVer
Speaker          163      163

```

Last Modified: Sep 17 15:46:18.649 for 00:07:36

Paths: (1 available, best #1)

```

Not advertised to any peer
Path #1: Received by speaker 0
Not advertised to any peer
Local

```



```
10.0.0.1 (metric 3) from 10.0.0.101 (10.0.0.1)
Received Label 24012
Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-
candidate, imported
Received Path ID 1, Local Path ID 1, version 163
Extended community: RT:65000:1
Originator: 10.0.0.1, Cluster list: 10.0.0.101
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

Pode não haver um caminho **de backup (proteger multipath)**. Por exemplo, se houver **caminhos máximos de BGP 2** configurados e somente 2 caminhos forem recebidos, dois caminhos serão multipath e não haverá nenhum caminho **de backup (proteger multipath)**.

Conclusão: Todos os caminhos multipath estão instalados no RIB. Outro caminho é instalado como um caminho de backup (o caminho **de backup (proteger multipath)**). Apenas o melhor caminho é anunciado.

8. set path-select backup 1 install multipath-protect advertise

```
route-policy BGP-Path-Selection
  set path-selection backup 1 install multipath-protect advertise
end-policy
```

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```
Process          bRIB/RIB  SendTblVer
Speaker          5         5
```

```
Last Modified: Sep 17 16:03:00.907 for 00:01:19
```

```
Paths: (5 available, best #1)
```

```
Advertised to update-groups (with more than one peer):
```

```
0.2 0.3
```

```
Path #1: Received by speaker 0
```

```
Advertised to update-groups (with more than one peer):
```

```
0.2 0.3
```

```
Local, (Received from a RR-client)
```

```
10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
```

```
Received Path ID 0, Local Path ID 1, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #2: Received by speaker 0
```

```
Advertised to update-groups (with more than one peer):
```

```
0.3
```

```
Local, (Received from a RR-client)
```

```
10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
import-candidate, imported
```

```
Received Path ID 0, Local Path ID 2, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #3: Received by speaker 0
```

```
Not advertised to any peer
```

```
Local, (Received from a RR-client)
```

```
10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, multipath, import-candidate,
```

imported

```
Received Path ID 0, Local Path ID 0, version 0
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Not advertised to any peer
Local, (Received from a RR-client)
10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
Received Label 24013
Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),
add-path, import-candidate, imported
Received Path ID 0, Local Path ID 3, version 5
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Not advertised to any peer
Local, (Received from a RR-client)
10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
Received Label 24014
Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
Received Path ID 1, Local Path ID 0, version 0
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

RP/0/RP0/CPU0:RR#**show route vrf one 10.1.1.1/32**

```
Routing entry for 10.1.1.1/32
Known via "bgp 65000", distance 200, metric 0
Number of pic paths 1 , type internal
Installed Sep 17 16:03:01.199 for 00:05:13
Routing Descriptor Blocks
10.0.0.1, from 10.0.0.1, BGP multi path
  Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
  Route metric is 0
10.0.0.2, from 10.0.0.2, BGP multi path
  Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
  Route metric is 0
10.0.0.3, from 10.0.0.3, BGP multi path
  Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
  Route metric is 0
10.0.0.4, from 10.0.0.4, BGP backup path
  Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
  Route metric is 0
No advertising protos.
```

RP/0/RP0/CPU0:RR#**show cef vrf one 10.1.1.1/32**

```
10.1.1.1/32, version 281, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08
(0xf4e1108)
Updated Sep 17 16:03:01.206
Prefix Len 32, traffic index 0, precedence n/a, priority 3
via 10.0.0.1/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 0 NHID 0x0 [0xdab2bc0 0x0], Internal 0xd6a2190
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.1/32 via 24003/0/21
    next hop 10.1.101.1/32 Gi0/0/0/0 labels imposed {ImplNull 24012}
via 10.0.0.2/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 1 NHID 0x0 [0xdab2e48 0x0], Internal 0xd6a2550
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.2/32 via 24001/0/21
    next hop 10.2.101.2/32 Gi0/0/0/4 labels imposed {ImplNull 24012}
via 10.0.0.3/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 2 NHID 0x0 [0xdab2060 0x0], Internal 0xd6a2910
```

```

recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.3/32 via 24007/0/21
  next hop 10.3.101.3/32 Gi0/0/0/6   labels imposed {ImplNull 24012}
via 10.0.0.4/32, 2 dependencies, recursive, backup [flags 0x6100]
path-idx 3 NHID 0x0 [0xdab2c98 0x0]
recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.4/32 via 24000/0/21
  next hop 10.4.101.4/32 Gi0/0/0/7   labels imposed {ImplNull 24013}

```

Verifique os caminhos anunciados:

```
RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1

Versions:

Process	bRIB/RIB	SendTblVer
Speaker	181	181

Last Modified: Sep 17 16:03:02.649 for 00:07:39

Paths: (2 available, best #1)

Not advertised to any peer

Path #1: Received by speaker 0

Not advertised to any peer

Local

10.0.0.1 (metric 3) from 10.0.0.101 (10.0.0.1)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-candidate, imported

Received Path ID 1, Local Path ID 1, version 181

Extended community: RT:65000:1

Originator: 10.0.0.1, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #2: Received by speaker 0

Not advertised to any peer

Local

10.0.0.2 (metric 3) from 10.0.0.101 (10.0.0.2)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 2, Local Path ID 0, version 0

Extended community: RT:65000:1

Originator: 10.0.0.2, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

- Há três caminhos multipath.
- Há um caminho de "backup (proteger multipath)". Esse é o caminho de backup instalado na tabela RIB/CEF.
- O quinto caminho não está marcado.
- O melhor caminho e o caminho de backup são anunciados.

Pode não haver um caminho **de backup (proteger multipath)**. Por exemplo, se houver **caminhos máximos de BGP 2** configurados e apenas 2 caminhos forem recebidos, então dois caminhos são multipath e não há nenhum caminho **de backup (proteger multipath)**.

Esse caminho de backup anunciado é um dos caminhos multipath (backup marcado na tabela BGP).

Isto é com o **ibgp 1 de caminhos máximos**:

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1

Versions:

```
Process          bRIB/RIB  SendTblVer
Speaker          5         5
```

Last Modified: Sep 17 16:15:48.907 for 00:00:44

Paths: (5 available, best #1)

Advertised to update-groups (with more than one peer):
0.2 0.3

Path #1: Received by speaker 0

Advertised to update-groups (with more than one peer):
0.2 0.3

Local, (Received from a RR-client)

10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, **best**, group-best, import-candidate, imported

Received Path ID 0, Local Path ID 1, version 5

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #2: Received by speaker 0

Advertised to update-groups (with more than one peer):
0.2

Local, (Received from a RR-client)

10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, **backup**, add-path, import-candidate, imported

Received Path ID 0, Local Path ID 2, version 5

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #3: Received by speaker 0

Not advertised to any peer

Local, (Received from a RR-client)

10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 0, Local Path ID 0, version 0

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #4: Received by speaker 0

Not advertised to any peer

Local, (Received from a RR-client)

10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)

Received Label 24013

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 0, Local Path ID 0, version 0

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #5: Received by speaker 0

Not advertised to any peer

Local, (Received from a RR-client)

10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)

Received Label 24014

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 1, Local Path ID 0, version 0

Extended community: RT:65000:1

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

RP/0/RP0/CPU0:RR#show route vrf one 10.1.1.1/32

Routing entry for 10.1.1.1/32

Known via "bgp 65000", distance 200, metric 0

Number of pic paths 1 , type internal

Installed Sep 17 16:15:48.900 for 00:01:28

Routing Descriptor Blocks

10.0.0.1, from 10.0.0.1

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.2, from 10.0.0.2, **BGP backup path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

No advertising protos.

RP/0/RP0/CPU0:RR#show cef vrf one 10.1.1.1/32

10.1.1.1/32, version 297, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08 (0xf6960a8)

Updated Sep 17 16:15:48.903

Prefix Len 32, traffic index 0, precedence n/a, priority 3

via 10.0.0.1/32, 3 dependencies, recursive [flags 0x6000]

path-idx 0 NHID 0x0 [0xdab2bc0 0x0], Internal 0xd6a2190

recursion-via-/32

next hop VRF - 'default', table - 0xe0000000

next hop 10.0.0.1/32 via 24003/0/21

next hop 10.1.101.1/32 Gi0/0/0/0 labels imposed {ImplNull 24012}

via 10.0.0.2/32, 2 dependencies, recursive, **backup** [flags 0x6100]

path-idx 1 NHID 0x0 [0xdab2e48 0x0]

recursion-via-/32

next hop VRF - 'default', table - 0xe0000000

next hop 10.0.0.2/32 via 24001/0/21

next hop 10.2.101.2/32 Gi0/0/0/4 labels imposed {ImplNull 24012}

Verifique os caminhos anunciados:

RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1

Versions:

Process	bRIB/RIB	SendTblVer
---------	----------	------------

Speaker	189	189
---------	-----	-----

Last Modified: Sep 17 16:15:50.649 for 00:02:10

Paths: (2 available, best #1)

Not advertised to any peer

Path #1: Received by speaker 0

Not advertised to any peer

Local

10.0.0.1 (metric 3) from 10.0.0.101 (10.0.0.1)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-candidate, imported

Received Path ID 1, Local Path ID 1, version 189

Extended community: RT:65000:1

Originator: 10.0.0.1, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #2: Received by speaker 0

Not advertised to any peer

Local

10.0.0.2 (metric 3) from 10.0.0.101 (10.0.0.2)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 2, Local Path ID 0, version 0

Extended community: RT:65000:1

Originator: 10.0.0.2, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

- Não há nenhum ECMP no RR.
- O segundo melhor caminho é o caminho de backup. Ele é instalado na tabela RIB/CEF.

- O melhor caminho e o melhor caminho de backup são anunciados.
- Não há nenhum caminho de backup (proteger multipath).

Conclusão: Todos os caminhos multipath estão instalados no RIB. Outro caminho é instalado como um caminho de backup. O melhor caminho e o caminho de backup são anunciados.

9. set path-select group-best advertise

- A opção Group-best só pode ser usada com **anúncios**.
- A melhor seleção de grupo é o melhor caminho por AS (sistema autônomo) e também por próximo salto.
- O prefixo tem origem em diferentes sistemas autônomos.

Uma topologia diferente é usada para esse caso. Os roteadores são os mesmos da imagem 1, mas o PE4 agora está no AS 65004 e o PE5 está no AS 65005. Todos os outros roteadores ainda estão no AS 65000.

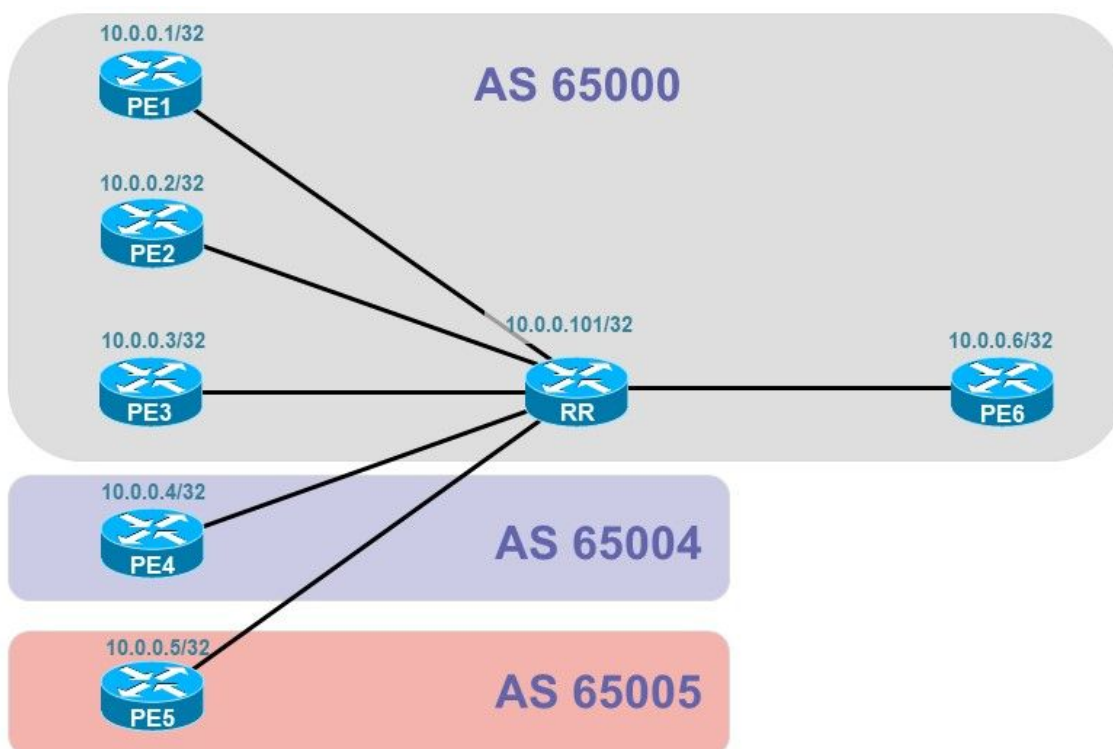


Imagem 2

Isso significa que agora há uma sessão eBGP entre o RR e o PE4 e entre o RR e o PE5.

```
route-policy BGP-Path-Selection
  set path-selection group-best advertise
end-policy
```

```
RP/0/RP0/CPU0:RR#show bgp vpv4 unicast rd 1:1 10.1.1.1/32
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

Process	bRIB/RIB	SendTblVer
Speaker	5	5
Local Label: 24010		

```
Last Modified: Sep 21 06:06:29.117 for 00:02:18
```

```

Paths: (5 available, best #1)
Advertised to update-groups (with more than one peer):
  0.3 0.4
Path #1: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.3 0.4
Local, (Received from a RR-client)
  10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
    Received Label 24014
    Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
    Received Path ID 1, Local Path ID 1, version 5
    Extended community: RT:65000:1
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #2: Received by speaker 0
Not advertised to any peer
Local, (Received from a RR-client)
  10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
    Received Label 24014
    Origin incomplete, metric 0, localpref 100, valid, internal, multipath, import-candidate,
imported
    Received Path ID 1, Local Path ID 0, version 0
    Extended community: RT:65000:1
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #3: Received by speaker 0
Not advertised to any peer
Local, (Received from a RR-client)
  10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
    Received Label 24014
    Origin incomplete, metric 0, localpref 100, valid, internal, multipath, import-candidate,
imported
    Received Path ID 1, Local Path ID 0, version 0
    Extended community: RT:65000:1
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.4
65004
  10.4.101.4 from 10.4.101.4 (10.0.0.4)
    Received Label 24015
    Origin incomplete, metric 0, localpref 100, valid, external, group-best, add-path, import-
candidate, imported
    Received Path ID 0, Local Path ID 2, version 5
    Extended community: RT:65000:1
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.4
65005
  10.5.101.5 from 10.5.101.5 (10.0.0.5)
    Received Label 24014
    Origin incomplete, metric 0, localpref 100, valid, external, group-best, add-path, import-
candidate, imported
    Received Path ID 0, Local Path ID 3, version 5
    Extended community: RT:65000:1
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

```
RP/0/RP0/CPU0:RR#show route vrf one 10.1.1.1/32
```

```
Routing entry for 10.1.1.1/32
```

```
Known via "bgp 65000", distance 200, metric 0, type internal
```

```
Installed Sep 20 19:59:07.762 for 10:00:40
```

```
Routing Descriptor Blocks
```

```
  10.0.0.1, from 10.0.0.1, BGP multi path
```

```
Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
Route metric is 0
10.0.0.2, from 10.0.0.2, BGP multi path
Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
Route metric is 0
10.0.0.3, from 10.0.0.3, BGP multi path
Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
Route metric is 0
No advertising protos.
```

RP/0/RP0/CPU0:RR#show cef vrf one 10.1.1.1/32

10.1.1.1/32, version 114, internal 0x1000001 0x30 (ptr 0xd96a338) [1], 0x0 (0xe366530), 0xa08 (0xf69e0a8)

Updated Sep 20 19:59:07.765

Prefix Len 32, traffic index 0, precedence n/a, priority 3

via 10.0.0.1/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]

path-idx 0 NHID 0x0 [0xdab1b98 0x0]

recursion-via-/32

next hop VRF - 'default', table - 0xe0000000

next hop 10.0.0.1/32 via 24008/0/21

local label 24010

next hop 10.1.101.1/32 Gi0/0/0/0 labels imposed {ImplNull 24014}

via 10.0.0.2/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]

path-idx 1 NHID 0x0 [0xdab30d0 0x0]

recursion-via-/32

next hop VRF - 'default', table - 0xe0000000

next hop 10.0.0.2/32 via 24000/0/21

local label 24010

next hop 10.2.101.2/32 Gi0/0/0/4 labels imposed {ImplNull 24014}

via 10.0.0.3/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]

path-idx 2 NHID 0x0 [0xdab2918 0x0]

recursion-via-/32

next hop VRF - 'default', table - 0xe0000000

next hop 10.0.0.3/32 via 24002/0/21

local label 24010

next hop 10.3.101.3/32 Gi0/0/0/6 labels imposed {ImplNull 24014}

O RR ainda tem três caminhos ECMP instalados na tabela RIB e CEF.

RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1

Versions:

Process	bRIB/RIB	SendTblVer
---------	----------	------------

Speaker	47	47
---------	----	----

Last Modified: Sep 20 19:59:07.588 for 09:59:44

Paths: (3 available, best #1)

Not advertised to any peer

Path #1: Received by speaker 0

Not advertised to any peer

Local

10.0.0.3 (metric 5) from 10.0.0.101 (10.0.0.3)

Received Label 24014

Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-candidate, imported

Received Path ID 1, Local Path ID 1, version 47

Extended community: RT:65000:1

Originator: 10.0.0.3, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #2: Received by speaker 0

Not advertised to any peer

65004

10.4.101.4 (metric 3) from 10.0.0.101 (10.0.0.101)


```

Received Label 24010
Origin incomplete, metric 0, localpref 100, valid, internal, group-best, import-candidate,
imported
Received Path ID 2, Local Path ID 0, version 0
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #3: Received by speaker 0
Not advertised to any peer
65005
10.5.101.5 (metric 2) from 10.0.0.101 (10.0.0.101)
Received Label 24010
Origin incomplete, metric 0, localpref 100, valid, internal, group-best, import-candidate,
imported
Received Path ID 3, Local Path ID 0, version 0
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

O RR anuncia o melhor caminho do grupo dos três caminhos recebidos do AS 65000. Além desse caminho, o RR também anuncia o melhor caminho do grupo recebido do AS 65004 e o do AS 65005.

Há três caminhos de melhor grupo porque os três caminhos têm um AS vizinho diferente. Todos esses caminhos são anunciados. Os caminhos multipath não são anunciados.

Conclusão: Todos os melhores caminhos de grupo são anunciados.

10. set path-select backup 1 install multipath-protect advertise multipath-protect-advertise

Esta opção só está disponível a partir do Cisco IOS®-XR 7.3.1.

Para começar com o Cisco IOS®-XR 7.3.1, há uma nova palavra-chave **multipath-protect-advertise**.

Isso permite que o caminho **de proteção de vários caminhos** seja anunciado junto ao caminho de **backup**. Antes do Cisco IOS®-XR 7.3.1, o caminho **de proteção de vários caminhos** foi instalado, mas não anunciado. (Consulte o caso 8.)

```

route-policy BGP-Path-Selection
  set path-selection backup 1 install multipath-protect advertise multipath-protect-advertise
end-policy
!

```

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:
Process          bRIB/RIB  SendTblVer
Speaker          5         5
Last Modified: Sep 17 16:43:05.907 for 00:01:14
Paths: (5 available, best #1)
Advertised to update-groups (with more than one peer):
  0.2 0.3
Path #1: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.2 0.3
Local, (Received from a RR-client)
  10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)

```

```

Received Label 24012
Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
Received Path ID 0, Local Path ID 1, version 5
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #2: Received by speaker 0
Advertised to update-groups (with more than one peer):
0.3
Local, (Received from a RR-client)
10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
Received Label 24012
Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
import-candidate, imported
Received Path ID 0, Local Path ID 2, version 5
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #3: Received by speaker 0
Not advertised to any peer
Local, (Received from a RR-client)
10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
Received Label 24012
Origin incomplete, metric 0, localpref 100, valid, internal, multipath, import-candidate,
imported
Received Path ID 0, Local Path ID 0, version 0
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Advertised to update-groups (with more than one peer):
0.3
Local, (Received from a RR-client)
10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
Received Label 24013
Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),
add-path, import-candidate, imported
Received Path ID 0, Local Path ID 3, version 5
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Not advertised to any peer
Local, (Received from a RR-client)
10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
Received Label 24014
Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
Received Path ID 1, Local Path ID 0, version 0
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

RP/0/RP0/CPU0:RR#**show route vrf one 10.1.1.1**

Routing entry for 10.1.1.1/32

Known via "bgp 65000", distance 200, metric 0

Number of pic paths 1 , type internal

Installed Sep 17 16:43:05.562 for 00:01:45

Routing Descriptor Blocks

10.0.0.1, from 10.0.0.1, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.2, from 10.0.0.2, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.3, from 10.0.0.3, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

```
10.0.0.4, from 10.0.0.4, BGP backup path
  Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
  Route metric is 0
No advertising protos.
```

```
RP/0/RP0/CPU0:RR#show cef vrf one 10.1.1.1
```

```
10.1.1.1/32, version 323, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08 (0xf4e1168)
```

```
Updated Sep 17 16:43:05.567
```

```
Prefix Len 32, traffic index 0, precedence n/a, priority 3
  via 10.0.0.1/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
    path-idx 0 NHID 0x0 [0xdab2bc0 0x0], Internal 0xd6a2190
    recursion-via-/32
    next hop VRF - 'default', table - 0xe0000000
    next hop 10.0.0.1/32 via 24003/0/21
      next hop 10.1.101.1/32 Gi0/0/0/0 labels imposed {ImplNull 24012}
  via 10.0.0.2/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
    path-idx 1 NHID 0x0 [0xdab2e48 0x0], Internal 0xd6a2730
    recursion-via-/32
    next hop VRF - 'default', table - 0xe0000000
    next hop 10.0.0.2/32 via 24001/0/21
      next hop 10.2.101.2/32 Gi0/0/0/4 labels imposed {ImplNull 24012}
  via 10.0.0.3/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
    path-idx 2 NHID 0x0 [0xdab2060 0x0], Internal 0xd6a2910
    recursion-via-/32
    next hop VRF - 'default', table - 0xe0000000
    next hop 10.0.0.3/32 via 24007/0/21
      next hop 10.3.101.3/32 Gi0/0/0/6 labels imposed {ImplNull 24012}
  via 10.0.0.4/32, 2 dependencies, recursive, backup [flags 0x6100]
    path-idx 3 NHID 0x0 [0xdab2c98 0x0]
    recursion-via-/32
    next hop VRF - 'default', table - 0xe0000000
    next hop 10.0.0.4/32 via 24000/0/21
      next hop 10.4.101.4/32 Gi0/0/0/7 labels imposed {ImplNull 24013}
```

Verifique os caminhos anunciados:

```
RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```
Process          bRIB/RIB  SendTblVer
Speaker          207      207
```

```
Last Modified: Sep 17 16:43:06.649 for 00:02:31
```

```
Paths: (3 available, best #1)
```

```
Not advertised to any peer
```

```
Path #1: Received by speaker 0
```

```
Not advertised to any peer
```

```
Local
```

```
10.0.0.1 (metric 3) from 10.0.0.101 (10.0.0.1)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-candidate, imported
```

```
Received Path ID 1, Local Path ID 1, version 207
```

```
Extended community: RT:65000:1
```

```
Originator: 10.0.0.1, Cluster list: 10.0.0.101
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #2: Received by speaker 0
```

```
Not advertised to any peer
```

```
Local
```

```
10.0.0.2 (metric 3) from 10.0.0.101 (10.0.0.2)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
```

```

Received Path ID 2, Local Path ID 0, version 0
Extended community: RT:65000:1
Originator: 10.0.0.2, Cluster list: 10.0.0.101
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #3: Received by speaker 0
Not advertised to any peer
Local
 10.0.0.4 (metric 3) from 10.0.0.101 (10.0.0.4)
  Received Label 24013
  Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
  Received Path ID 3, Local Path ID 0, version 0
  Extended community: RT:65000:1
  Originator: 10.0.0.4, Cluster list: 10.0.0.101
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

Conclusão: Todos os caminhos multipath estão instalados no RIB. Outro caminho - **backup (proteger multipath) path**- é instalado como um caminho de backup. O melhor caminho, o caminho de backup e o caminho **de backup (proteger multipath)** são anunciados.

11. set path-select multipath advertise multipath-protect

Esta opção só está disponível a partir do Cisco IOS®-XR 7.3.1.

```

route-policy BGP-Path-Selection
  set path-selection multipath advertise multipath-protect
end-policy
!

```

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```

Process          bRIB/RIB  SendTblVer
Speaker          5         5

```

```
Last Modified: Sep 18 06:12:25.907 for 00:00:12
```

```
Paths: (5 available, best #1)
```

```

Advertised to update-groups (with more than one peer):
 0.2 0.3

```

```
Path #1: Received by speaker 0
```

```

Advertised to update-groups (with more than one peer):
 0.2 0.3

```

```
Local, (Received from a RR-client)
```

```
10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath, import-candidate, imported
```

```
Received Path ID 0, Local Path ID 1, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #2: Received by speaker 0
```

```

Advertised to update-groups (with more than one peer):
 0.3

```

```
Local, (Received from a RR-client)
```

```
10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-candidate, imported
```

```
Received Path ID 0, Local Path ID 3, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #3: Received by speaker 0
```

```

Not advertised to any peer
Local, (Received from a RR-client)
  10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
    Received Label 24012
    Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),
add-path, import-candidate, imported
    Received Path ID 0, Local Path ID 4, version 5
    Extended community: RT:65000:1
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.3
Local, (Received from a RR-client)
  10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
    Received Label 24013
    Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
    Received Path ID 0, Local Path ID 2, version 5
    Extended community: RT:65000:1
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Not advertised to any peer
Local, (Received from a RR-client)
  10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
    Received Label 24014
    Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
    Received Path ID 1, Local Path ID 0, version 0
    Extended community: RT:65000:1
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

RP/0/RP0/CPU0:RR#show route vrf one 10.1.1.1/32

Routing entry for 10.1.1.1/32

Known via "bgp 65000", distance 200, metric 0

Number of pic paths 1 , type internal

Installed Sep 18 06:12:26.137 for 00:05:23

Routing Descriptor Blocks

10.0.0.1, from 10.0.0.1, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.2, from 10.0.0.2, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.3, from 10.0.0.3, **BGP backup path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.4, from 10.0.0.4, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

No advertising protos.

RP/0/RP0/CPU0:RR#show cef vrf one 10.1.1.1/32

10.1.1.1/32, version 345, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08 (0xf4e1108)

Updated Sep 18 06:12:26.140

Prefix Len 32, traffic index 0, precedence n/a, priority 3

via 10.0.0.1/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]

path-idx 0 NHID 0x0 [0xdab2bc0 0x0], Internal 0xd6a2190

recursion-via-/32

next hop VRF - 'default', table - 0xe0000000

next hop 10.0.0.1/32 via 24003/0/21

next hop 10.1.101.1/32 Gi0/0/0 labels imposed {ImplNull 24012}

via 10.0.0.2/32, 3 dependencies, recursive, **bgp-multipath** [flags 0x6080]

path-idx 1 NHID 0x0 [0xdab2e48 0x0], Internal 0xd6a2730

```

recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.2/32 via 24001/0/21
  next hop 10.2.101.2/32 Gi0/0/0/4    labels imposed {ImplNull 24012}
via 10.0.0.3/32, 2 dependencies, recursive, backup [flags 0x6100]
path-idx 2 NHID 0x0 [0xdab2060 0x0]
recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.3/32 via 24007/0/21
  next hop 10.3.101.3/32 Gi0/0/0/6    labels imposed {ImplNull 24012}
via 10.0.0.4/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
path-idx 3 NHID 0x0 [0xdab2c98 0x0], Internal 0xd6a2550
recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.4/32 via 24000/0/21
  next hop 10.4.101.4/32 Gi0/0/0/7    labels imposed {ImplNull 24013}

```

Verifique os caminhos anunciados:

```
RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1

Versions:

Process	bRIB/RIB	SendTblVer
Speaker	221	221

Last Modified: Sep 18 06:12:27.649 for 00:01:38

Paths: (3 available, best #1)

Not advertised to any peer

Path #1: Received by speaker 0

Not advertised to any peer

Local

10.0.0.1 (metric 3) from 10.0.0.101 (10.0.0.1)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-candidate, imported

Received Path ID 1, Local Path ID 1, version 221

Extended community: RT:65000:1

Originator: 10.0.0.1, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #2: Received by speaker 0

Not advertised to any peer

Local

10.0.0.4 (metric 3) from 10.0.0.101 (10.0.0.4)

Received Label 24013

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 2, Local Path ID 0, version 0

Extended community: RT:65000:1

Originator: 10.0.0.4, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #3: Received by speaker 0

Not advertised to any peer

Local

10.0.0.2 (metric 3) from 10.0.0.101 (10.0.0.2)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported

Received Path ID 3, Local Path ID 0, version 0

Extended community: RT:65000:1

Originator: 10.0.0.2, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

- O terceiro caminho é o caminho de backup. Ele é marcado como backup (proteger multipath) no BGP e instalado como um caminho de backup no RIB.
- O melhor caminho e os caminhos multipath são anunciados.

- O caminho "backup(protect multipath)" não é anunciado.

12. set path-select multipath advertise multipath-protect multipath-protect-advertise

Isso permite que o caminho de proteção de vários caminhos seja instalado e anunciado junto com os caminhos de vários caminhos.

```
route-policy BGP-Path-Selection
```

```
  set path-selection multipath advertise multipath-protect multipath-protect-advertise
end-policy
```

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```
  Process          bRIB/RIB  SendTblVer
  Speaker          5         5
```

```
Last Modified: Sep 18 06:22:22.907 for 00:03:12
```

```
Paths: (5 available, best #1)
```

```
  Advertised to update-groups (with more than one peer):
```

```
    0.2 0.3
```

```
  Path #1: Received by speaker 0
```

```
  Advertised to update-groups (with more than one peer):
```

```
    0.2 0.3
```

```
  Local, (Received from a RR-client)
```

```
    10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
```

```
      Received Label 24012
```

```
      Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
```

```
import-candidate, imported
```

```
      Received Path ID 0, Local Path ID 1, version 5
```

```
      Extended community: RT:65000:1
```

```
      Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
  Path #2: Received by speaker 0
```

```
  Advertised to update-groups (with more than one peer):
```

```
    0.2
```

```
  Local, (Received from a RR-client)
```

```
    10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
```

```
      Received Label 24012
```

```
      Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),
```

```
add-path, import-candidate, imported
```

```
      Received Path ID 0, Local Path ID 4, version 5
```

```
      Extended community: RT:65000:1
```

```
      Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
  Path #3: Received by speaker 0
```

```
  Not advertised to any peer
```

```
  Local, (Received from a RR-client)
```

```
    10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
```

```
      Received Label 24012
```

```
      Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
```

```
      Received Path ID 0, Local Path ID 0, version 0
```

```
      Extended community: RT:65000:1
```

```
      Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
  Path #4: Received by speaker 0
```

```
  Advertised to update-groups (with more than one peer):
```

```
    0.2
```

```
  Local, (Received from a RR-client)
```

```
    10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
```

```
      Received Label 24013
```

```
      Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-candidate, imported
```

```
Received Path ID 0, Local Path ID 2, version 5
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Advertised to update-groups (with more than one peer):
0.2
Local, (Received from a RR-client)
10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
Received Label 24014
Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
Received Path ID 1, Local Path ID 3, version 5
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
RP/0/RP0/CPU0:RR#show route vrf one 10.1.1.1/32
```

```
Routing entry for 10.1.1.1/32
Known via "bgp 65000", distance 200, metric 0
Number of pic paths 1 , type internal
Installed Sep 18 06:22:23.059 for 00:03:34
Routing Descriptor Blocks
10.0.0.1, from 10.0.0.1, BGP multi path
  Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
  Route metric is 0
10.0.0.2, from 10.0.0.2, BGP backup path
  Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
  Route metric is 0
10.0.0.4, from 10.0.0.4, BGP multi path
  Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
  Route metric is 0
10.0.0.5, from 10.0.0.5, BGP multi path
  Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
  Route metric is 0
No advertising protos.
```

```
RP/0/RP0/CPU0:RR#show cef vrf one 10.1.1.1/32
```

```
10.1.1.1/32, version 367, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08
(0xf4e11c8)
Updated Sep 18 06:22:23.062
Prefix Len 32, traffic index 0, precedence n/a, priority 3
via 10.0.0.1/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 0 NHID 0x0 [0xdab2bc0 0x0], Internal 0xd6a2190
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.1/32 via 24003/0/21
    next hop 10.1.101.1/32 Gi0/0/0/0 labels imposed {ImplNull 24012}
via 10.0.0.2/32, 2 dependencies, recursive, backup [flags 0x6100]
  path-idx 1 NHID 0x0 [0xdab2e48 0x0]
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.2/32 via 24001/0/21
    next hop 10.2.101.2/32 Gi0/0/0/4 labels imposed {ImplNull 24012}
via 10.0.0.4/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 2 NHID 0x0 [0xdab2c98 0x0], Internal 0xd6a2550
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.4/32 via 24000/0/21
    next hop 10.4.101.4/32 Gi0/0/0/7 labels imposed {ImplNull 24013}
via 10.0.0.5/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 3 NHID 0x0 [0xdab2368 0x0], Internal 0xd6a2910
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.5/32 via 24005/0/21
```


next hop 10.5.101.5/32 Gi0/0/0/1 labels imposed {ImplNull 24014}

Verifique os caminhos anunciados:

```
RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1

```
Process          bRIB/RIB  SendTblVer
Speaker          235      235
Last Modified: Sep 18 06:22:24.649 for 00:03:59
Paths: (4 available, best #1)
Not advertised to any peer
Path #1: Received by speaker 0
Not advertised to any peer
Local
  10.0.0.1 (metric 3) from 10.0.0.101 (10.0.0.1)
    Received Label 24012
    Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-
candidate, imported
    Received Path ID 1, Local Path ID 1, version 235
    Extended community: RT:65000:1
    Originator: 10.0.0.1, Cluster list: 10.0.0.101
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #2: Received by speaker 0
Not advertised to any peer
Local
  10.0.0.4 (metric 3) from 10.0.0.101 (10.0.0.4)
    Received Label 24013
    Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
    Received Path ID 2, Local Path ID 0, version 0
    Extended community: RT:65000:1
    Originator: 10.0.0.4, Cluster list: 10.0.0.101
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #3: Received by speaker 0
Not advertised to any peer
Local
  10.0.0.5 (metric 3) from 10.0.0.101 (10.0.0.5)
    Received Label 24014
    Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
    Received Path ID 3, Local Path ID 0, version 0
    Extended community: RT:65000:1
    Originator: 10.0.0.5, Cluster list: 10.0.0.101
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Not advertised to any peer
Local
  10.0.0.2 (metric 3) from 10.0.0.101 (10.0.0.2)
    Received Label 24012
    Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
    Received Path ID 4, Local Path ID 0, version 0
    Extended community: RT:65000:1
    Originator: 10.0.0.2, Cluster list: 10.0.0.101
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

Conclusão:

- Todos os 3 caminhos são marcados como multipath no BGP.
- 3 caminhos ECMP são instalados na tabela RIB/CEF.
- O segundo caminho é o caminho de backup. Marcada como backup (proteger multipath) no BGP e instalada como um caminho de backup na tabela RIB/CEF.
- O melhor caminho e os caminhos de multipath e os caminhos de "backup(protect multipath)"

são anunciados.

Novo comportamento de seleção de caminho a partir do Cisco IOS®-XR 7.3.1

A partir do Cisco IOS®-XR 7.3.1, isso mudou:

- A seleção de caminho por vizinho é possível. Antes do Cisco IOS®-XR 7.3.1, isso era somente por família de endereços.
- São permitidas várias instruções set path-select em uma política de rota.
- Os caminhos BGP podem ser exibidos na ordem em que são recebidos.

A seleção de caminho por vizinho é possível

Esta é a seleção de caminho disponível em uma política de rota:

```
RP/0/RP0/CPU0:RR(config-rpl)#set path-selection ?
all          BGP all paths
backup      BGP backup path
best-path   BGP best path
group-best  BGP group best path
multipath   BGP multipath
```

O melhor caminho é o padrão.

Isso é suportado no nível da família de endereços.

Exemplo de configuração:

```
router bgp 65000
address-family ipv4 unicast
!
address-family vpnv4 unicast
additional-paths receive
additional-paths send
  additional-paths selection route-policy BGP-Path-Selection
!
neighbor 10.0.0.1
remote-as 65000
update-source Loopback0
address-family ipv4 unicast
  route-reflector-client
!
address-family vpnv4 unicast
  route-reflector-client
!
!
vrf one
rd 1:1
address-family ipv4 unicast
  maximum-paths ibgp 2
  additional-paths selection route-policy BGP-Path-Selection
  redistribute connected
!
!
```

!

Para começar com o Cisco IOS®-XR 7.3.1, algumas opções de seleção de caminho em uma política de rota também são suportadas no nível vizinho. Isso leva a um controle mais granular sobre quais caminhos são anunciados para quais vizinhos de BGP. Como exemplo, um alto-falante BGP pode anunciar o melhor caminho e um caminho de backup para um vizinho BGP, mas anunciar o multipath e proteger o caminho multipath para outro vizinho.

No nível vizinho, há:

```
RP/0/RP0/CPU0:RR(config-rpl)#if destination ?
in                               Member of a set
  is-all                         Check for additional paths selected by all path-selection
  is-backup-path                 Checks for backup path
is-best-external                 Checks for best external route
  is-best-path                   Checks for best path
  is-multi-path                  Checks for multiple paths
  is-multipath-protect           Checks for multipath-protect path
longer-than                      Prefix-length greater than the route's prefix length
or-longer                        Prefix-length equal to or greater than the route's prefix length
```

aviso: O melhor caminho é o multipath se o comando BGP **maximum-path** estiver configurado. No entanto, se a única condição configurada na política de rota for **is-multi-path**, somente os caminhos multipath que não são o melhor caminho serão anunciados! Depende do design do BGP, mas é provável que se os caminhos multipath devam ser anunciados, então o melhor caminho também deve ser anunciado.

O **IS-all** e **is-multipath-protect** são lançados recentemente com o Cisco IOS®-XR 7.3.1.

Instruções de seleção de caminho de vários conjuntos são permitidas em uma política de rota

A partir do Cisco IOS®-XR 7.3.1, você pode ter instruções **multiple-set path-select** em uma política de rota relacionada a um prefixo. Antes do Cisco IOS®-XR 7.3.1, isso não era permitido e levaria a um comportamento imprevisível de caminho de BGP.

A seleção de mais de um caminho ou não é observada por prefixo.

Por exemplo, **antes do** Cisco IOS®-XR 7.3.1, não há suporte para o seguinte:

```
route-policy add-path-to-ibgp
set weight 65000
  set path-selection backup 1 install
set metric-type type-1
set extcommunity rt RT BUSINESS additive
  set path-selection all advertise
set rib-metric 100
end-policy
```

Você tem duas instruções **set path-select** em uma política de rota aplicadas aos mesmos prefixos.

No entanto, **antes do** Cisco IOS®-XR 7.3.1, o seguinte é suportado. O motivo é que as diferentes instruções de seleção de caminho são para prefixos diferentes, porque **se** forem usadas instruções com uma seleção (destino, comunidade, ...).

Exemplo 1:

```
route-policy ADDPATH
  if destination in TRAFFIC_1 then
    set path-selection backup 1 install
  endif
  if destination in TRAFFIC_2 then
    set path-selection multipath advertise
  endif
end-policy
```

Isso é bom porque as instruções **set-path select** se relacionam a prefixos diferentes (estão em duas instruções **if** diferentes).

Exemplo 2:

```
route-policy ADDPATH-2
  if community matches-any COMM_ADD-PATH then
    set path-selection backup 1 install multipath-protect advertise
  else
    set path-selection best-path
  endif
end-policy
```

Isso é bom porque as instruções de seleção de caminho do conjunto se relacionam a prefixos diferentes (estão em duas partes diferentes da instrução **if**).

Começando com o Cisco IOS®-XR 7.3.1, isso é suportado.

Este é um exemplo de uma política de rota com mais de uma instrução **set path-select**:

```
route-policy BGP-Path-Selection
  set path-selection multipath advertise
  set path-selection backup 1 install multipath-protect advertise multipath-protect-advertise
end-policy
!
```

A política de rota por vizinho especifica quais caminhos são anunciados a esse vizinho. Qualquer caminho só pode ser escolhido dos caminhos já marcados no nível endereço-família.

No nível da família de endereços, você tem a seleção do caminho:

```
RP/0/RP0/CPU0:RR(config-rpl)#set path-selection ?
all          BGP all paths
backup       BGP backup path
best-path    BGP best path
group-best   BGP group best path
multipath    BGP multipath
```

No nível vizinho, há:

```
RP/0/RP0/CPU0:RR(config-rpl)#if destination ?
in           Member of a set
  is-all      Check for additional paths selected by all path-selection
  is-backup-path Checks for backup path
  is-best-external Checks for best external route
  is-best-path Checks for best path
```

is-multi-path	Checks for multiple paths
is-multipath-protect	Checks for multipath-protect path
longer-than	Prefix-length greater than the route's prefix length
or-longer	Prefix-length equal to or greater than the route's prefix length

aviso: O melhor caminho é o multipath se o comando BGP **maximum-path** estiver configurado. No entanto, se a única condição configurada na política de rota for **is-multi-path**, somente os caminhos multipath que não são o melhor caminho serão anunciados! Depende do design do BGP, mas é provável que se os caminhos multipath devam ser anunciados, então o melhor caminho também deve ser anunciado.

O **IS-all** e **is-multipath-protect** são lançados recentemente com o Cisco IOS®-XR 7.3.1.

Com essa abordagem, a **marcação** da seleção de caminho pode ser uma combinação dos modos de seleção de caminho que você tem (por exemplo, tudo, backup, multipath, proteção de vários caminhos e assim por diante).

A política de vizinhos controla o **anúncio** com base na marcação de seleção de caminho.

Para a parte de marcação: por exemplo, você pode ter backup e multipath configurados juntos na política de rota no nível da família de endereços:

```
route-policy BGP-Path-Selection
  set path-selection multipath advertise (1)
  set path-selection backup 1 install multipath-protect advertise multipath-protect-advertise
(2)
end-policy
!
```

As duas instruções de seleção de caminho definidas acima são as que são suportadas recentemente a partir do Cisco IOS®-XR 7.3.1. Com o caminho máximo ibgp 3 ainda configurado no exemplo, você tem estes:

- Permite que o melhor caminho e todos os caminhos multipath sejam anunciados.
- Permite que o melhor caminho e o caminho de backup (proteger multipath) sejam anunciados.

Essa combinação não foi possível antes do Cisco IOS®-XR 7.3.1. Isto significa que os (1) ou (2) estarão em vigor.

Este é o resultado:

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:
  Process          bRIB/RIB   SendTblVer
  Speaker          5          5
Last Modified: Sep 18 06:59:27.907 for 00:00:28
Paths: (5 available, best #1)
  Advertised to update-groups (with more than one peer):
    0.2 0.3
  Path #1: Received by speaker 0
  Advertised to update-groups (with more than one peer):
    0.2 0.3
  Local, (Received from a RR-client)
```

```

10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
  Received Path ID 0, Local Path ID 1, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #2: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.2
Local, (Received from a RR-client)
10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
import-candidate, imported
  Received Path ID 0, Local Path ID 2, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #3: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.2
Local, (Received from a RR-client)
10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),
add-path, import-candidate, imported
  Received Path ID 0, Local Path ID 3, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Advertised to update-groups (with more than one peer):
  0.2
Local, (Received from a RR-client)
10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
  Received Label 24013
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
  Received Path ID 0, Local Path ID 4, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Not advertised to any peer
Local, (Received from a RR-client)
10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
  Received Label 24014
  Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
  Received Path ID 1, Local Path ID 0, version 0
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

RP/0/RP0/CPU0:RR#**show route vrf one 10.1.1.1/32**

Routing entry for 10.1.1.1/32

Known via "bgp 65000", distance 200, metric 0

Number of pic paths 1 , type internal

Installed Sep 18 06:59:27.833 for 00:01:59

Routing Descriptor Blocks

10.0.0.1, from 10.0.0.1, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.2, from 10.0.0.2, **BGP multi path**

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

10.0.0.3, from 10.0.0.3, **BGP backup path**

```
Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
Route metric is 0
10.0.0.4, from 10.0.0.4, BGP multi path
Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
Route metric is 0
No advertising protos.
```

RP/0/RP0/CPU0:RR#show cef vrf one 10.1.1.1/32

10.1.1.1/32, version 409, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08 (0xf4e1168)

Updated Sep 18 06:59:27.836

```
Prefix Len 32, traffic index 0, precedence n/a, priority 3
via 10.0.0.1/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 0 NHID 0x0 [0xdab2bc0 0x0], Internal 0xd6a2190
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.1/32 via 24003/0/21
    next hop 10.1.101.1/32 Gi0/0/0/0 labels imposed {ImplNull 24012}
via 10.0.0.2/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 1 NHID 0x0 [0xdab2e48 0x0], Internal 0xd6a2550
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.2/32 via 24001/0/21
    next hop 10.2.101.2/32 Gi0/0/0/4 labels imposed {ImplNull 24012}
via 10.0.0.3/32, 2 dependencies, recursive, backup [flags 0x6100]
  path-idx 2 NHID 0x0 [0xdab2060 0x0]
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.3/32 via 24007/0/21
    next hop 10.3.101.3/32 Gi0/0/0/6 labels imposed {ImplNull 24012}
via 10.0.0.4/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 3 NHID 0x0 [0xdab2c98 0x0], Internal 0xd6a2370
  recursion-via-/32
  next hop VRF - 'default', table - 0xe0000000
  next hop 10.0.0.4/32 via 24000/0/21
    next hop 10.4.101.4/32 Gi0/0/0/7 labels imposed {ImplNull 24013}
```

Verifique os caminhos anunciados:

RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1

Versions:

```
Process          bRIB/RIB  SendTblVer
Speaker          271      271
```

Last Modified: Sep 18 06:59:28.649 for 00:01:53

Paths: (4 available, best #1)

Not advertised to any peer

Path #1: Received by speaker 0

Not advertised to any peer

Local

10.0.0.1 (metric 3) from 10.0.0.101 (10.0.0.1)

Received Label 24012

Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-candidate, imported

Received Path ID 1, Local Path ID 1, version 271

Extended community: RT:65000:1

Originator: 10.0.0.1, Cluster list: 10.0.0.101

Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

Path #2: Received by speaker 0

Not advertised to any peer

Local

10.0.0.2 (metric 3) from 10.0.0.101 (10.0.0.2)

```

Received Label 24012
Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
Received Path ID 2, Local Path ID 0, version 0
Extended community: RT:65000:1
Originator: 10.0.0.2, Cluster list: 10.0.0.101
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #3: Received by speaker 0
Not advertised to any peer
Local
  10.0.0.3 (metric 3) from 10.0.0.101 (10.0.0.3)
    Received Label 24012
    Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
    Received Path ID 3, Local Path ID 0, version 0
    Extended community: RT:65000:1
    Originator: 10.0.0.3, Cluster list: 10.0.0.101
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Not advertised to any peer
Local
  10.0.0.4 (metric 3) from 10.0.0.101 (10.0.0.4)
    Received Label 24013
    Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
    Received Path ID 4, Local Path ID 0, version 0
    Extended community: RT:65000:1
    Originator: 10.0.0.4, Cluster list: 10.0.0.101
    Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

Agora é possível anunciar a um vizinho os caminhos principal (melhor caminho) e de backup, com base em *is-best-path* ou *is-backup-path*.

Para outro vizinho, o multipath pode ser anunciado com **is-multi-path**.

Exemplo de política de rota vizinha (usada com a política de rota no nível de família de endereços):

```

route-policy BGP-neighbor-1
  if community matches-any COMM-LIST-1 then
    if destination is-best-path or destination is-backup-path then
      pass
    else
      drop
    endif
  elseif community matches-any COMM-LIST-2 then
    if destination is-multi-path or destination is-multipath-protect then
      pass
    else
      drop
    endif
  else
    drop
  endif
end-policy
!

```

Se o RR tiver estes caminhos de BGP:

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:
  Process          bRIB/RIB  SendTblVer

```



```

Speaker                5                5
Last Modified: Sep 18 07:14:32.907 for 00:06:53
Paths: (5 available, best #1)
  Advertised to update-groups (with more than one peer):
    0.3
  Advertised to peers (in unique update groups):
    10.0.0.6          10.0.0.5
  Path #1: Received by speaker 0
  Advertised to update-groups (with more than one peer):
    0.3
  Advertised to peers (in unique update groups):
    10.0.0.6          10.0.0.5
  Local, (Received from a RR-client)
    10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
      Received Label 24012
      Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
      Received Path ID 0, Local Path ID 1, version 5
      Extended community: RT:65000:1
      Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
  Path #2: Received by speaker 0
  Advertised to peers (in unique update groups):
    10.0.0.6          10.0.0.5
  Local, (Received from a RR-client)
    10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
      Received Label 24012
      Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
import-candidate, imported
      Received Path ID 0, Local Path ID 2, version 5
      Extended community: RT:65000:1
      Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
  Path #3: Received by speaker 0
  Advertised to peers (in unique update groups):
    10.0.0.5
  Local, (Received from a RR-client)
    10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
      Received Label 24012
      Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
      Received Path ID 0, Local Path ID 4, version 5
      Extended community: RT:65000:1
      Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
  Path #4: Received by speaker 0
  Advertised to peers (in unique update groups):
    10.0.0.5
  Local, (Received from a RR-client)
    10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
      Received Label 24013
      Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),
add-path, import-candidate, imported
      Received Path ID 0, Local Path ID 3, version 5
      Extended community: RT:65000:1
      Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
  Path #5: Received by speaker 0
  Not advertised to any peer
  Local, (Received from a RR-client)
    10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
      Received Label 24014
      Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
      Received Path ID 1, Local Path ID 0, version 0
      Extended community: RT:65000:1
      Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

Em seguida, para o primeiro caminho da política de rota do vizinho, que é:

```
if destination is-best-path or destination is-backup-path then
pass
```

O vizinho PE6 recebe estes caminhos:

```
RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```
Process          bRIB/RIB  SendTblVer
```

```
Speaker          283      283
```

```
Last Modified: Sep 18 07:14:33.649 for 00:07:21
```

```
Paths: (2 available, best #1)
```

```
Not advertised to any peer
```

```
Path #1: Received by speaker 0
```

```
Not advertised to any peer
```

```
Local
```

```
10.0.0.1 (metric 3) from 10.0.0.101 (10.0.0.1)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-candidate, imported
```

```
Received Path ID 1, Local Path ID 1, version 283
```

```
Extended community: RT:65000:1
```

```
Originator: 10.0.0.1, Cluster list: 10.0.0.101
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #2: Received by speaker 0
```

```
Not advertised to any peer
```

```
Local
```

```
10.0.0.2 (metric 3) from 10.0.0.101 (10.0.0.2)
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
```

```
Received Path ID 2, Local Path ID 0, version 0
```

```
Extended community: RT:65000:1
```

```
Originator: 10.0.0.2, Cluster list: 10.0.0.101
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

Esses dois caminhos são o melhor caminho e o caminho de backup no RR.

Para a segunda parte da política de rota do vizinho, que é:

```
if destination is-multi-path or destination is-multipath-protect
then
```

```
pass
```

O vizinho PE6 recebe estes caminhos:

```
RP/0/RP0/CPU0:PE6#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```
Process          bRIB/RIB  SendTblVer
```

```
Speaker          299      299
```

```
Last Modified: Sep 18 07:31:09.649 for 00:02:29
```

```
Paths: (3 available, best #1)
```

```
Not advertised to any peer
```

```
Path #1: Received by speaker 0
```

```
Not advertised to any peer
```

```
Local
```

```
10.0.0.2 (metric 3) from 10.0.0.101 (10.0.0.2)
```

```
Received Label 24012
```

```

Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-
candidate, imported
Received Path ID 2, Local Path ID 1, version 299
Extended community: RT:65000:1
Originator: 10.0.0.2, Cluster list: 10.0.0.101
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #2: Received by speaker 0
Not advertised to any peer
Local
10.0.0.4 (metric 3) from 10.0.0.101 (10.0.0.4)
Received Label 24013
Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
Received Path ID 3, Local Path ID 0, version 0
Extended community: RT:65000:1
Originator: 10.0.0.4, Cluster list: 10.0.0.101
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #3: Received by speaker 0
Not advertised to any peer
Local
10.0.0.3 (metric 3) from 10.0.0.101 (10.0.0.3)
Received Label 24012
Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
Received Path ID 4, Local Path ID 0, version 0
Extended community: RT:65000:1
Originator: 10.0.0.3, Cluster list: 10.0.0.101
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

Esses caminhos são os caminhos multipath (mas **não** incluindo o melhor caminho!) e o caminho backup (proteger multipath).

Mostrar os caminhos do BGP na ordem em que são recebidos

Os caminhos BGP são mostrados em ordem lexicográfica.

Um novo comando - introduzido no Cisco IOS®-XR 7.3.1- pode ser usado para ver os caminhos BGP na ordem em que foram recebidos:

```
show bgp <afi> rd <rd> <path_details> <age-order>
```

Esse comando é útil para ver por que os caminhos foram marcados como multipath. Os caminhos recebidos anteriormente são marcados como multipath e instalados no RIB como rotas de caminho máximo. O comando **show route** mostra a palavra-chave **BGP multipath** para as rotas instaladas como tal.

Para verificar qual caminho é marcado como multipath, o novo comando pode ser usado para verificar a ordem em que todos os caminhos foram recebidos. Os caminhos mais recentes estão na parte superior da saída.

Por exemplo, com a seguinte configuração:

```

route-policy BGP-Path-Selection
  set path-selection multipath advertise
  set path-selection backup 1 install multipath-protect advertise multipath-protect-advertise
end-policy
!

```

Não há alterações no processo de decisão do melhor caminho, nem os caminhos têm atributos (como preferência local) que afetam o processo de decisão do melhor caminho.

O RR tem esta seleção de caminho BGP:

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```
Process          bRIB/RIB  SendTblVer
Speaker          5         5
```

```
Last Modified: Sep 18 08:46:11.907 for 00:03:43
```

```
Paths: (5 available, best #1)
```

```
Advertised to update-groups (with more than one peer):
 0.3
```

```
Advertised to peers (in unique update groups):
10.0.0.5
```

```
Path #1: Received by speaker 0
```

```
Advertised to update-groups (with more than one peer):
 0.3
```

```
Advertised to peers (in unique update groups):
10.0.0.5
```

```
Local, (Received from a RR-client)
```

```
10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,  
import-candidate, imported
```

```
Received Path ID 0, Local Path ID 1, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #2: Received by speaker 0
```

```
Advertised to peers (in unique update groups):
10.0.0.5
```

```
Local, (Received from a RR-client)
```

```
10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,  
import-candidate, imported
```

```
Received Path ID 0, Local Path ID 2, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #3: Received by speaker 0
```

```
Advertised to peers (in unique update groups):
10.0.0.5      10.0.0.6
```

```
Local, (Received from a RR-client)
```

```
10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-  
candidate, imported
```

```
Received Path ID 0, Local Path ID 3, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #4: Received by speaker 0
```

```
Advertised to peers (in unique update groups):
10.0.0.5      10.0.0.6
```

```
Local, (Received from a RR-client)
```

```
10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
Received Label 24013
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),  
add-path, import-candidate, imported
```

```
Received Path ID 0, Local Path ID 4, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #5: Received by speaker 0
```

```
Not advertised to any peer
```

```
Local, (Received from a RR-client)
 10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
   Received Label 24014
   Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
   Received Path ID 1, Local Path ID 0, version 0
   Extended community: RT:65000:1
   Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

Por que o caminho de 10.0.0.1 é o melhor caminho? Por que o caminho de 10.0.0.2 é o caminho de backup? Por que o caminho do multipath 10.0.0.3 é? Por que o caminho de 10.0.0.4 é o backup (proteger multipath)? Por que o caminho de 10.0.0.5 não é o melhor caminho, não é o multipath, e não o caminho de backup (proteger multipath)?

Você pode ver isso com o mesmo comando com **ordem de idade** no final. Os caminhos mais recentes estão na parte superior da saída.

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32 age-order
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```
Process          bRIB/RIB  SendTblVer
Speaker          5         5
```

```
Flags: 0x240692b2+0x00010000; multipath; backup available;
```

```
Last Modified: Sep 18 07:31:07.907 for 00:23:23
```

```
Paths: (5 available, best #3)
```

```
Advertised to update-groups (with more than one peer):
```

```
0.3
```

```
Advertised to peers (in unique update groups):
```

```
10.0.0.5
```

```
Path #1: Received by speaker 0
```

```
Flags: 0x2000000084060205, import: 0x96
```

```
Advertised to peers (in unique update groups):
```

```
10.0.0.6      10.0.0.5
```

```
Local, (Received from a RR-client)
```

```
10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4), if-handle 0x00000000
```

```
Received Label 24013
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),
```

```
add-path, import-candidate, imported
```

```
Received Path ID 0, Local Path ID 3, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #2: Received by speaker 0
```

```
Flags: 0x2000000084020205, import: 0x96
```

```
Not advertised to any peer
```

```
Local, (Received from a RR-client)
```

```
10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5), if-handle 0x00000000
```

```
Received Label 24014
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
```

```
Received Path ID 1, Local Path ID 0, version 0
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #3: Received by speaker 0
```

```
Flags: 0x2000000085070205, import: 0x9f
```

```
Advertised to update-groups (with more than one peer):
```

```
0.3
```

```
Advertised to peers (in unique update groups):
```

```
10.0.0.5
```

```
Local, (Received from a RR-client)
```

```
10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1), if-handle 0x00000000
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
```

```
import-candidate, imported
```

```

Received Path ID 0, Local Path ID 1, version 5
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Flags: 0x2000000084070205, import: 0x96
Advertised to peers (in unique update groups):
 10.0.0.6      10.0.0.5
Local, (Received from a RR-client)
 10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3), if-handle 0x00000000
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
  Received Path ID 0, Local Path ID 4, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Flags: 0x2000000084070205, import: 0x96
Advertised to peers (in unique update groups):
 10.0.0.6      10.0.0.5
Local, (Received from a RR-client)
 10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2), if-handle 0x00000000
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
import-candidate, imported
  Received Path ID 0, Local Path ID 2, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

Você pode usar os comandos show bgp com a palavra-chave **bestpath-compare** para verificar por que um caminho não é o melhor caminho (um motivo é mostrado por caminho).

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32 bestpath-compare
```

```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:
Process          bRIB/RIB  SendTblVer
Speaker          5         5
  Flags: 0x240692b2+0x00010000; multipath; backup available;
Last Modified: Sep 18 07:31:07.907 for 00:44:59
Paths: (5 available, best #1)
Advertised to update-groups (with more than one peer):
 0.3
Advertised to peers (in unique update groups):
 10.0.0.5
Path #1: Received by speaker 0
Flags: 0x2000000085070205, import: 0x9f
Advertised to update-groups (with more than one peer):
 0.3
Advertised to peers (in unique update groups):
 10.0.0.5
Local, (Received from a RR-client)
 10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1), if-handle 0x00000000
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
  Received Path ID 0, Local Path ID 1, version 5
  Extended community: RT:65000:1
  best of local AS, Overall best
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #2: Received by speaker 0
Flags: 0x2000000084070205, import: 0x96
Advertised to peers (in unique update groups):
 10.0.0.6      10.0.0.5

```

```

Local, (Received from a RR-client)
 10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2), if-handle 0x00000000
   Received Label 24012
   Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
import-candidate, imported
   Received Path ID 0, Local Path ID 2, version 5
   Extended community: RT:65000:1
   iBGP multi-path
   Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
   Path #3: Received by speaker 0
   Flags: 0x2000000084070205, import: 0x96
   Advertised to peers (in unique update groups):
     10.0.0.6      10.0.0.5
Local, (Received from a RR-client)
 10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3), if-handle 0x00000000
   Received Label 24012
   Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
   Received Path ID 0, Local Path ID 4, version 5
   Extended community: RT:65000:1
   iBGP multi-path
   Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
   Path #4: Received by speaker 0
   Flags: 0x2000000084060205, import: 0x96
   Advertised to peers (in unique update groups):
     10.0.0.6      10.0.0.5
Local, (Received from a RR-client)
 10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4), if-handle 0x00000000
   Received Label 24013
   Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),
add-path, import-candidate, imported
   Received Path ID 0, Local Path ID 3, version 5
   Extended community: RT:65000:1
   Higher router ID than best path (path #1)
   Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
   Path #5: Received by speaker 0
   Flags: 0x2000000084020205, import: 0x96
   Not advertised to any peer
Local, (Received from a RR-client)
 10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5), if-handle 0x00000000
   Received Label 24014
   Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
   Received Path ID 1, Local Path ID 0, version 0
   Extended community: RT:65000:1
   Higher router ID than best path (path #1)
   Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

Como a maioria dos atributos nos caminhos do BGP é igual entre os caminhos, a decisão de escolher o melhor caminho foi para o ID de roteador mais baixo do alto-falante do BGP. Aqui está o alto-falante BGP 10.0.0.1. O caminho de backup é o segundo melhor caminho, daí o segundo ID de roteador mais baixo do alto-falante BGP. Aqui está 10.0.0.2.

Os caminhos de 10.0.0.4 e 10.0.0.5 não são caminhos multipath porque foram instalados mais tarde do que os caminhos de 10.0.0.1, 10.0.0.2 e 10.0.0.3.

Caminho de backup versus backup (proteger multipath)

```

route-policy BGP-Path-Selection
  set path-selection multipath advertise
  set path-selection backup 1 install multipath-protect advertise multipath-protect-advertise
end-policy

```

!
O caminho máximo ibgp 3 está configurado.

O backup é o segundo melhor caminho. Aqui, os caminhos multipath foram recebidos antes do caminho de backup. Portanto, há três caminhos multipath e outro é um caminho de backup.

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32 age-order
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```
Process          bRIB/RIB  SendTblVer
```

```
Speaker          5         5
```

```
Flags: 0x240692b2+0x00010000; multipath; backup available;
```

```
Last Modified: Sep 18 08:51:17.907 for 00:07:11
```

```
Paths: (5 available, best #3)
```

```
Advertised to update-groups (with more than one peer):
```

```
0.3
```

```
Advertised to peers (in unique update groups):
```

```
10.0.0.5
```

```
Path #1: Received by speaker 0
```

```
Flags: 0x2000000084020205, import: 0x96
```

```
Not advertised to any peer
```

```
Local, (Received from a RR-client)
```

```
10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4), if-handle 0x00000000
```

```
Received Label 24013
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
```

```
Received Path ID 0, Local Path ID 0, version 0
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #2: Received by speaker 0
```

```
Flags: 0x2000000084060205, import: 0x96
```

```
Advertised to peers (in unique update groups):
```

```
10.0.0.5
```

```
Local, (Received from a RR-client)
```

```
10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2), if-handle 0x00000000
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, backup, add-path, import-candidate, imported
```

```
Received Path ID 0, Local Path ID 2, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #3: Received by speaker 0
```

```
Flags: 0x2000000085070205, import: 0x9f
```

```
Advertised to update-groups (with more than one peer):
```

```
0.3
```

```
Advertised to peers (in unique update groups):
```

```
10.0.0.5
```

```
Local, (Received from a RR-client)
```

```
10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1), if-handle 0x00000000
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath, import-candidate, imported
```

```
Received Path ID 0, Local Path ID 1, version 5
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #4: Received by speaker 0
```

```
Flags: 0x2000000084070205, import: 0x96
```

```
Advertised to peers (in unique update groups):
```

```
10.0.0.6
```

```
Local, (Received from a RR-client)
```

```
10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5), if-handle 0x00000000
```



```
Received Label 24014
Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
Received Path ID 1, Local Path ID 3, version 5
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Flags: 0x2000000084070205, import: 0x96
Advertised to peers (in unique update groups):
 10.0.0.5      10.0.0.6
Local, (Received from a RR-client)
 10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3), if-handle 0x00000000
Received Label 24012
Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
Received Path ID 0, Local Path ID 4, version 5
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

Desligue o vizinho 10.0.0.5. Agora você tem:

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32 age-order
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```
Process          bRIB/RIB  SendTblVer
Speaker          7         7
```

```
Flags: 0x2406b2b2+0x00010000; multipath; backup available;
```

```
Last Modified: Sep 18 09:05:07.907 for 00:00:23
```

```
Paths: (4 available, best #3)
```

```
Advertised to update-groups (with more than one peer):
```

```
0.3
```

```
Path #1: Received by speaker 0
```

```
Flags: 0x2000000084060205, import: 0x96
```

```
Advertised to peers (in unique update groups):
```

```
10.0.0.6
```

```
Local, (Received from a RR-client)
```

```
10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4), if-handle 0x00000000
```

```
Received Label 24013
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),
add-path, import-candidate, imported
```

```
Received Path ID 0, Local Path ID 5, version 7
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #2: Received by speaker 0
```

```
Flags: 0x2000000084070205, import: 0x96
```

```
Advertised to peers (in unique update groups):
```

```
10.0.0.6
```

```
Local, (Received from a RR-client)
```

```
10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2), if-handle 0x00000000
```

```
Received Label 24012
```

```
Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
import-candidate, imported
```

```
Received Path ID 0, Local Path ID 2, version 7
```

```
Extended community: RT:65000:1
```

```
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #3: Received by speaker 0
```

```
Flags: 0x2000000085070205, import: 0x9f
```

```
Advertised to update-groups (with more than one peer):
```

```
0.3
```

```
Local, (Received from a RR-client)
```

```
10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1), if-handle 0x00000000
```

```
Received Label 24012
```

```

Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
Received Path ID 0, Local Path ID 1, version 5
Extended community: RT:65000:1
Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Flags: 0x2000000084070205, import: 0x96
Advertised to peers (in unique update groups):
  10.0.0.6
Local, (Received from a RR-client)
  10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3), if-handle 0x00000000
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
  Received Path ID 0, Local Path ID 4, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

- O caminho de 10.0.0.5 desapareceu.
- O caminho de 10.0.0.2 ainda é backup, mas agora também é multipath.
- Como o caminho de backup também é um caminho multipath, agora você tem um caminho de backup (proteger multipath). Este é o caminho de 10.0.0.4.

Desfeche o vizinho 10.0.0.5:

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32 age-order
```

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
```

```
Versions:
```

```
Process          bRIB/RIB  SendTblVer
```

```
Speaker          10        10
```

```
Flags: 0x2406b2b2+0x00010000; multipath; backup available;
```

```
Last Modified: Sep 18 09:08:42.907 for 00:00:00
```

```
Paths: (5 available, best #4)
```

```
Advertised to update-groups (with more than one peer):
```

```
  0.3
```

```
Advertised to peers (in unique update groups):
```

```
  10.0.0.5
```

```
Path #1: Received by speaker 0
```

```
Flags: 0x2000000084020205, import: 0x96
```

```
Not advertised to any peer
```

```
Local, (Received from a RR-client)
```

```
  10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5), if-handle 0x00000000
```

```
  Received Label 24014
```

```
  Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
```

```
  Received Path ID 1, Local Path ID 0, version 0
```

```
  Extended community: RT:65000:1
```

```
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #2: Received by speaker 0
```

```
Flags: 0x2000000084060205, import: 0x96
```

```
Advertised to peers (in unique update groups):
```

```
  10.0.0.5      10.0.0.6
```

```
Local, (Received from a RR-client)
```

```
  10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4), if-handle 0x00000000
```

```
  Received Label 24013
```

```
  Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),
add-path, import-candidate, imported
```

```
  Received Path ID 0, Local Path ID 5, version 7
```

```
  Extended community: RT:65000:1
```

```
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

```
Path #3: Received by speaker 0
```

```
Flags: 0x2000000084070205, import: 0x96
```

```

Advertised to peers (in unique update groups):
 10.0.0.5      10.0.0.6
Local, (Received from a RR-client)
 10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2), if-handle 0x00000000
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
import-candidate, imported
  Received Path ID 0, Local Path ID 2, version 10
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Flags: 0x2000000085070205, import: 0x9f
Advertised to update-groups (with more than one peer):
 0.3
Advertised to peers (in unique update groups):
 10.0.0.5
Local, (Received from a RR-client)
 10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1), if-handle 0x00000000
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
  Received Path ID 0, Local Path ID 1, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Flags: 0x2000000084070205, import: 0x96
Advertised to peers (in unique update groups):
 10.0.0.5      10.0.0.6
Local, (Received from a RR-client)
 10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3), if-handle 0x00000000
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
  Received Path ID 0, Local Path ID 4, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

Nada mudou para os 4 caminhos que foram instalados antes. Somente o caminho de 10.0.0.5 foi adicionado. Ela fica no topo porque é mais nova. Não é um caminho de backup de vários caminhos ou qualquer tipo.

O caminho de 10.0.0.5 mudou de multipath para não-multipath após uma alteração de estado no caminho!

Conclusão:

- A ordem em que os caminhos são recebidos desempenha um papel na determinação de quais caminhos são multipath.
- A ordem em que os caminhos são recebidos desempenha uma função se houver um caminho de backup (proteger multipath) ou não.
- A ordem em que os caminhos são recebidos não desempenha uma função na qual o caminho é escolhido como o melhor caminho ou caminho de backup.

Pedido por Métrica IGP

Há uma opção para ordenar os caminhos multipath de acordo com a métrica IGP (Interior Gateway Protocol).

```

RP/0/RP0/CPU0:RR#conf t
RP/0/RP0/CPU0:RR(config)#router bgp 65000
RP/0/RP0/CPU0:RR(config-bgp)#vrf one
RP/0/RP0/CPU0:RR(config-bgp-vrf)#address-family ipv4 unicast
RP/0/RP0/CPU0:RR(config-bgp-vrf-af)#maximum-paths ibgp 3 unequal-cost ?
deterministic Deterministic Multipath selection primarily on IGP metric order
selective Allow multipaths only from marked neighbors
<cr>
RP/0/RP0/CPU0:RR(config-bgp-vrf-af)#maximum-paths ibgp 3 unequal-cost deterministic ?
selective Allow multipaths only from marked neighbors
<cr>
RP/0/RP0/CPU0:RR(config-bgp-vrf-af)#maximum-paths ibgp 3 unequal-cost deterministic
RP/0/RP0/CPU0:RR(config-bgp-vrf-af)#commit
RP/0/RP0/CPU0:RR(config-bgp-vrf-af)#end
RP/0/RP0/CPU0:RR#

```

O custo desigual é necessário, caso contrário, você acaba com apenas o melhor caminho, um caminho de backup, mas nenhum multipath porque o multipath precisa do mesmo custo IGP para ser considerado multipath.

O custo IGP do RR para os roteadores PE é alterado na topologia. O custo IGP é configurado da seguinte forma:

- RR para PE1: 5
- RR para PE2: 4
- RR para PE3: 3
- RR para PE4: 2
- RR para PE5: 1

Ainda há estes:

```

route-policy BGP-Path-Selection
  set path-selection multipath advertise
  set path-selection backup 1 install multipath-protect advertise multipath-protect-advertise
end-policy
!

```

Antes das alterações da métrica IGP (o custo é o mesmo em todos os links):

```

RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:
  Process          bRIB/RIB   SendTblVer
  Speaker          10         10
Last Modified: Sep 18 09:08:42.907 for 05:26:53
Paths: (5 available, best #1)
  Advertised to update-groups (with more than one peer):
    0.3
  Advertised to peers (in unique update groups):
    10.0.0.5
  Path #1: Received by speaker 0
  Advertised to update-groups (with more than one peer):
    0.3
  Advertised to peers (in unique update groups):
    10.0.0.5
  Local, (Received from a RR-client)
    10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
      Received Label 24012
      Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,

```

```

import-candidate, imported
  Received Path ID 0, Local Path ID 1, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #2: Received by speaker 0
Advertised to peers (in unique update groups):
  10.0.0.5      10.0.0.6
Local, (Received from a RR-client)
  10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
import-candidate, imported
  Received Path ID 0, Local Path ID 2, version 10
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #3: Received by speaker 0
Advertised to peers (in unique update groups):
  10.0.0.5      10.0.0.6
Local, (Received from a RR-client)
  10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
  Received Path ID 0, Local Path ID 4, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Advertised to peers (in unique update groups):
  10.0.0.5      10.0.0.6
Local, (Received from a RR-client)
  10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
  Received Label 24013
  Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),
add-path, import-candidate, imported
  Received Path ID 0, Local Path ID 5, version 7
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Not advertised to any peer
Local, (Received from a RR-client)
  10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
  Received Label 24014
  Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
  Received Path ID 1, Local Path ID 0, version 0
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

Após a alteração da métrica IGP:

```
RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32 age-order
```

```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:
  Process          bRIB/RIB  SendTblVer
  Speaker          14        14
  Flags: 0x2486b2b2+0x00010000; multipath; backup available;
Last Modified: Sep 18 16:09:45.907 for 00:01:10
Paths: (5 available, best #2)
Advertised to update-groups (with more than one peer):
  0.3
Path #1: Received by speaker 0
Flags: 0x2000000084020205, import: 0x94
Not advertised to any peer

```

```

Local, (Received from a RR-client)
 10.0.0.1 (metric 6) from 10.0.0.1 (10.0.0.1), if-handle 0x00000000
   Received Label 24012
   Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
   Received Path ID 1, Local Path ID 0, version 0
   Extended community: RT:65000:1
   Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #2: Received by speaker 0
Flags: 0x2000000085070205, import: 0x9f
Advertised to update-groups (with more than one peer):
 0.3
Local, (Received from a RR-client)
 10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5), if-handle 0x00000000
   Received Label 24014
   Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
   Received Path ID 1, Local Path ID 1, version 11
   Extended community: RT:65000:1
   Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #3: Received by speaker 0
Flags: 0x2000000084060205, import: 0x94
Advertised to update-groups (with more than one peer):
 0.3
Advertised to peers (in unique update groups):
 10.0.0.6
Local, (Received from a RR-client)
 10.0.0.2 (metric 5) from 10.0.0.2 (10.0.0.2), if-handle 0x00000000
   Received Label 24012
   Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),
add-path, import-candidate, imported
   Received Path ID 1, Local Path ID 3, version 10
   Extended community: RT:65000:1
   Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Flags: 0x2000000084070205, import: 0xd4
Advertised to update-groups (with more than one peer):
 0.3
Advertised to peers (in unique update groups):
 10.0.0.6
Local, (Received from a RR-client)
 10.0.0.4 (metric 3) from 10.0.0.4 (10.0.0.4), if-handle 0x00000000
   Received Label 24013
   Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
import-candidate, imported
   Received Path ID 1, Local Path ID 5, version 14
   Extended community: RT:65000:1
   Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Flags: 0x2000000084070205, import: 0x94
Advertised to update-groups (with more than one peer):
 0.3
Advertised to peers (in unique update groups):
 10.0.0.6
Local, (Received from a RR-client)
 10.0.0.3 (metric 4) from 10.0.0.3 (10.0.0.3), if-handle 0x00000000
   Received Label 24012
   Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
   Received Path ID 1, Local Path ID 4, version 10
   Extended community: RT:65000:1
   Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

- O melhor caminho agora é o caminho de 10.0.0.5 devido à métrica IGP mais baixa (métrica 2).

- O caminho de backup agora é o caminho com a segunda melhor métrica IGP, o caminho de 10.0.0.4 (métrica 3).
- O melhor caminho e o melhor caminho de backup também são multipath, então um caminho multipath ainda precisa ser escolhido. Esse é o caminho de 10.0.0.3 (métrica 4).
- O caminho de backup (proteger multipath) é o caminho de 10.0.0.2 (métrica 5).
- Finalmente, o caminho de 10.0.0.1 (métrica 6) não está marcado, porque tem a pior métrica.