Configuración y Verificación de la Selección de Trayectoria BGP en IOS-XR

Contenido

Introducción

Este documento describe la instrucción **set path-select** en una política de ruta para el protocolo de gateway fronterizo (BGP) dentro del Cisco IOS®-XR.

Antecedentes

Muchos diseños apuntan a que BGP seleccione y anuncie varias trayectorias para un prefijo.

De forma predeterminada, sólo se selecciona una trayectoria BGP como mejor trayectoria y sólo se anuncia esta mejor trayectoria. El Algoritmo de Selección de la Mejor Trayectoria de BGP decide lo siguiente:

[Algoritmo de selección del mejor trayecto BGP](#)

Además del mejor trayecto, se puede elegir un segundo mejor trayecto como trayecto de

respaldo. Esta trayectoria de respaldo se puede utilizar en diseños con BGP PIC (Prefix Independent Convergence).

BGP puede instalar varias trayectorias para lograr el balanceo de carga. Puede ser equilibrio de carga de trayectos múltiples de igual coste (ECMP) o ruta múltiple de coste desigual (UCMP). Estas rutas múltiples se instalan en la tabla de ruteo (RIB) y en el plano de datos o en la tabla FIB (Base de instancia de reenvío) para lograr el equilibrio de carga. La tabla FIB también se conoce como tabla CEF (Cisco Express Forwarding).

Este artículo se centra en dos objetivos:

- ¿Cómo conseguir que BGP elija varias trayectorias para instalar?
- ¿Cómo conseguir que BGP anuncie varias trayectorias?

Otra función utilizada por BGP son Trayectorias Adicionales (ADD-Paths). Esta función permite que BGP anuncie más de una trayectoria a través de una sesión BGP.

Summary

- BGP siempre elige la mejor trayectoria. Si no, hay algo mal. Este artículo no cubre estos escenarios.
- Se puede elegir una ruta de respaldo si se configura la función específica (por ejemplo, BGP PIC).
- Una política de ruta se puede configurar bajo una familia de direcciones específica para que BGP seleccione las trayectorias que se van a instalar y/o anunciar.
- Antes de Cisco IOS®-XR 7.3.1, hay soporte para una sola instrucción **set path-select** en route-policy para seleccionar trayectos para un prefijo específico.
- Para comenzar con Cisco IOS®-XR 7.3.1, hay soporte para múltiples instrucciones **set path-select** en route-policy para seleccionar trayectos para un prefijo específico.
- A partir de Cisco IOS®-XR 7.3.1, se agregó una función donde se puede utilizar una política de ruta para anunciar trayectos específicos para un prefijo BGP a un vecino BGP.

La selección de trayectos múltiples por BGP se realiza por orden de recepción de las trayectorias. Sin embargo, los comandos **show bgp** muestran las trayectorias BGP en orden lexicográfico.

Un nuevo comando -introducido en Cisco IOS®-XR 7.3.1- se puede utilizar para ver las trayectorias BGP en el orden en que se recibieron:

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

Esto ayuda a la verificación y resolución de problemas de múltiples rutas. Se resuelve la pregunta principal de por qué se elige una ruta como trayecto múltiple y no como otra.

Una trayectoria multi-path-Protect es una trayectoria de respaldo que no es una trayectoria múltiple pero protege todas las otras trayectorias múltiples.

A partir de Cisco IOS®-XR 7.3.1, hay esta nueva palabra clave **multipath-Protect-advertise** para la **instrucción set path-select**. Se puede utilizar para anunciar la trayectoria multi-path-Protect **junto**

con la trayectoria de respaldo o junto con las trayectorias múltiples. Los comandos completos que se utilizarán en route-policy son:

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

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

Esta es una descripción general del comando **set path-select** con todas sus combinaciones de palabras clave En la siguiente sección se encuentran una explicación y ejemplos más detallados.

En todos los casos siguientes, se instala la mejor trayectoria. Si no lo es, algo está mal (por ejemplo, el salto siguiente no es válido), pero esto no está relacionado con el comando **set path-select**.

Para que se seleccione la trayectoria de respaldo, se debe habilitar una función para BGP que permita la selección de una trayectoria de respaldo BGP: por ejemplo BGP PIC.

Las trayectorias de trayectoria múltiple se habilitan en BGP mediante el comando address family **maximum-paths**:

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

Por definición, la mejor trayectoria es una trayectoria de múltiples rutas. La mejor trayectoria es la única trayectoria instalada en la tabla de ruteo si no se habilita el trayecto múltiple para BGP. Puede controlar cuántas trayectorias BGP se instalan en la tabla de ruteo con el comando **maximum-paths {ebgp | eibgp | ibgp} <2-32> (costo desigual)**.

Esta tabla proporciona una descripción general de todas las opciones con el comando **set path-select**. Para obtener más detalles y ejemplos, consulte la siguiente sección para cada caso presentado aquí.

Caso	Comando	Instalar	Anuncio
1	set path-select backup 1 install	1 ruta de copia de seguridad instalada.	Sólo se anuncia la m... trayectoria.
2	set path-select backup 1 advertise	La ruta de respaldo no está instalada.	Se anuncia la ruta de respaldo.
3	set path-select backup 1 advertise install	La ruta de respaldo está instalada.	Se anuncia la ruta de respaldo.
4	set path-select all advertise	La ruta de respaldo no está instalada. Se instalan las trayectorias de múltiples rutas.	Todas las trayectorias anuncian (mejor trayectoria, trayecto c... respaldo, trayecto mú... trayecto no multitraye...
5	set path-select-path	Se instalan las trayectorias de múltiples rutas.	Sólo se anuncia la m... trayectoria.
6	set path-select multipath advertise	Se instalan las trayectorias de múltiples rutas.	Se anuncian las trayectorias de trayec...

			múltiple.
7	set path-select backup 1 install multipath-Protect	Se instalan las trayectorias de múltiples rutas. Otra ruta de acceso se instala como una ruta de copia de seguridad (la ruta de acceso múltiple 'backup(Protect multipath)' si todavía hay rutas junto a las trayectorias de trayectoria múltiple.	Sólo se anuncia la m trayectoria.
8	set path-select backup 1 install multipath-Protect advertise	Se instalan las trayectorias de múltiples rutas. Otra ruta de acceso se instala como una ruta de copia de seguridad (la ruta de acceso múltiple 'backup(Protect multipath)' si todavía hay rutas junto a las trayectorias de trayectoria múltiple.	Se anuncian la mejor trayectoria y la trayec de respaldo. No se anuncia la ruta acceso múltiple de la de seguridad (protecc
9	set path-select group-best advertise	La mejor selección del grupo es la mejor trayectoria por AS y también por salto siguiente. Se instalan las trayectorias de múltiples rutas.	Se anuncian todas la trayectorias mejores grupo.
10	set path-select backup 1 install multipath-Protect advertise multipath-Protect-advertise	Se instalan las trayectorias de múltiples rutas. Otra ruta de acceso se instala como una ruta de copia de seguridad (la ruta de acceso múltiple 'backup(Protect multipath)' si todavía hay rutas junto a las trayectorias de trayectoria múltiple.	Se anuncia la mejor trayectoria, la trayecto de respaldo y la ruta respaldo (proteger múltiples rutas).
11	set path-select multipath advertise multipath-Protect	Se instalan las trayectorias de múltiples rutas.	Se anuncian las trayectorias de trayec múltiple. No se anuncia la ruta acceso múltiple de la de seguridad (protecc
12	set path-select multipath advertise multipath-Protect multipath-Protect-advertise	Se instalan las trayectorias de múltiples rutas. Otra ruta de acceso se instala como una ruta de copia de seguridad (la ruta de acceso múltiple 'backup(Protect multipath)'	Se anuncian las trayectorias de trayec múltiple. Se anuncia la ruta de copia de seguridad (proteger múltiples ru

si todavía hay rutas junto a
las trayectorias de
trayectoria múltiple.

Esta es la topología utilizada a lo largo de este documento.
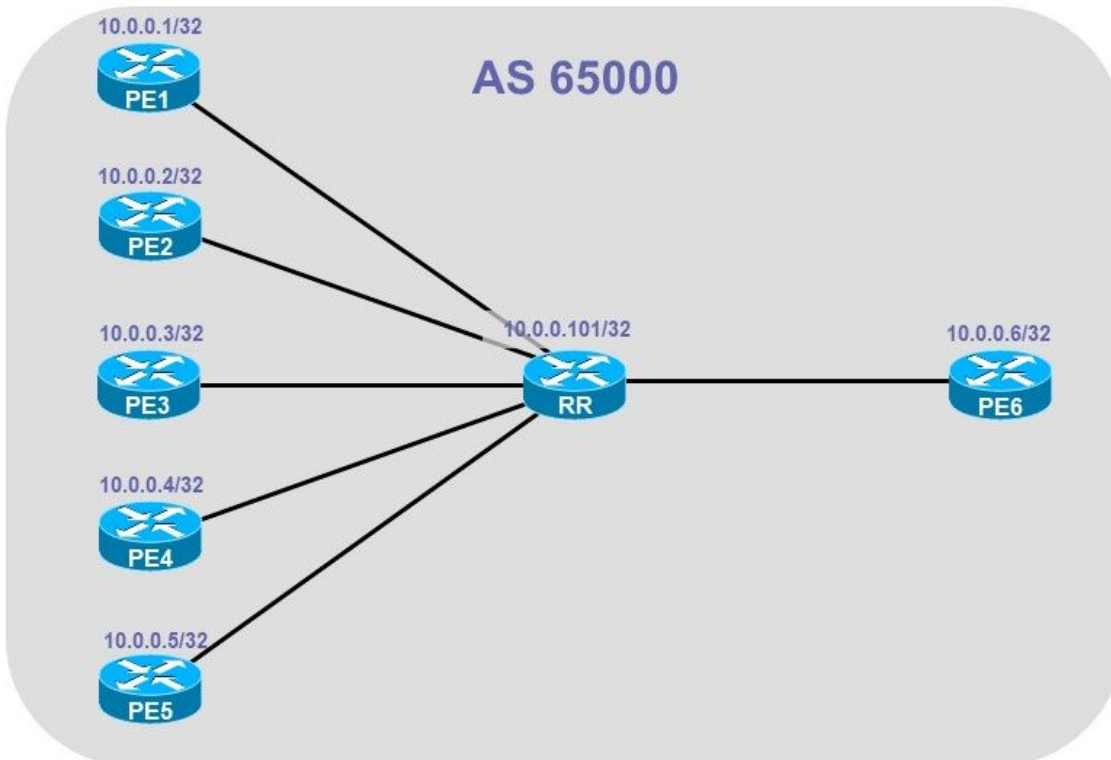
En todos los casos, ADD-PATH se habilita entre el RR (Route-Reflector) y PE6.

PE1, PE2, PE3, PE4, PE5 y PE6 anuncian el mismo prefijo que la ruta unicast vpnv4 hacia el RR.

PE6 es el PE de ingreso, que recibe este prefijo del RR.

A menos que se mencione lo contrario, ADD-PATH se habilita en cada sesión BGP y maximum-paths ibgp 3 se configura en el RR para la unidifusión address-family vpnv4.

> **Nota:** Hay un máximo de una trayectoria de respaldo instalada en las tablas RIB y CEF. No es posible/compatible más de uno. La trayectoria se marca como una copia de seguridad en la tabla BGP, la tabla RIB y la tabla CEF.

El BGP siempre elige la ruta de respaldo en este artículo. Otra función podría elegir una ruta de respaldo, pero aquí siempre es BGP.

Si se configura el trayecto múltiple para BGP, puede haber trayectos multipath (ECMP o UCMP) instalados en la tabla BGP. Están marcados con **múltiples rutas**. La trayectoria de respaldo es la

segunda mejor trayectoria, por lo que debería ser una de las trayectorias de múltiples trayectorias si hay alguna. Esto significa que BGP puede elegir una copia de seguridad (proteger múltiples rutas) si se configura esta función (la palabra clave **multipath-Protect** en la **instrucción set path-select route-policy**). Si este es el caso, esta ruta de **respaldo(proteger múltiples rutas)** es la trayectoria de respaldo en la tabla RIB y CEF. La trayectoria de **backup** elegida por BGP y marcada como tal por BGP no es entonces una trayectoria de respaldo, sino simplemente una trayectoria de múltiples trayectorias.

Una ruta de respaldo en un RR no tiene mucho sentido si ese RR sólo tiene la función de un RR.

En este artículo, se asume que el RR también es un router PE. En ese caso, la selección e instalación de una ruta de respaldo tiene sentido. La ruta de respaldo se podría utilizar para BGP PIC.

Una ruta de respaldo se marca con **respaldo** en el RIB cuando se especifica el prefijo específico o con "!" si no se especifica el prefijo.

```
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
```

Establecer comandos de selección de rutas en políticas de ruta

Esta sección cubre todas las sentencias **set path-select** usadas en la política de ruta para la familia de direcciones específica bajo el BGP del router.

Esto es independientemente de que la versión de Cisco IOS®-XR sea anterior o posterior a Cisco IOS®-XR 7.3.1.

Configuración:

```
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
 !
 !
 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
 !
 !
!
```

La política de ruta con las sentencias set path-select se aplica en la unidifusión address-family vpnv4.

La política de ruta con las sentencias set path-select también se aplica al VRF. Esto es necesario si se necesita instalar una ruta de respaldo en la tabla VRF RIB/CEF (o se anuncia a través de la sesión BGP sobre el link PE-CE).

Aquí, ambas políticas de ruta son las mismas, pero se pueden aplicar diferentes en la familia de direcciones frente a bajo el VRF.

La ruta máxima *ibgp 3* se utiliza en el VRF uno, especificando que puede haber hasta tres trayectos ECMP en la tabla RIB/CEF.

Estos casos muestran todas las posibilidades para la política de ruta con **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 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 13:14:35.907 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 las trayectorias anunciadas:


```
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
```
Conclusión: Hay 1 trayectoria de respaldo instalada en el RR en el VRF. Sólo se anuncia la mejor
trayectoria.

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 las trayectorias anunciadas:

```
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
```

Conclusión: La ruta de respaldo no está instalada. Se anuncia la ruta de respaldo.

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 las trayectorias anunciadas:

```
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
```

Conclusión: La ruta de respaldo está instalada. Se anuncia la ruta de respaldo. Esto es 1. y 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 las trayectorias anunciadas:

```
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
```

Conclusión: La ruta de respaldo no está instalada. Todas las (5) trayectorias se anuncian.

5. set path-select-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}
```

Conclusión: Sólo se instalan la mejor trayectoria y las trayectorias de trayectoria múltiple. Sólo se anuncia la mejor trayectoria. No hay ninguna ruta de copia de seguridad seleccionada, instalada o anunciada.

6. set path-select multipath advertise

Advertise es una palabra clave obligatoria.

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

Para que esto funcione, debe haber una trayectoria múltiple habilitada para BGP para la familia de direcciones específica.

Aquí, se habilita el trayecto múltiple para la unidifusión ipv4 en el VRF uno.

```
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 las trayectorias anunciadas:

```
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
```

- Las trayectorias vpnv4 se marcan con múltiples trayectorias.

- Las 3 trayectorias de trayectoria múltiple se instalan en la RIB.
- Se anuncian las 3 rutas de acceso múltiple.
- No hay ruta de respaldo.

Conclusión: Las trayectorias de trayectoria múltiple se instalan en la RIB y se anuncian. No hay ninguna copia de seguridad seleccionada, instalada o anunciada.

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 las trayectorias anunciadas:

```
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
```

Es posible que no haya una ruta de **copia de seguridad (proteger múltiples rutas)**. Por ejemplo, si hay **trayectorias máximas BGP 2** configuradas y sólo se reciben 2 trayectorias, entonces dos trayectorias son múltiples y no hay **trayectoria de respaldo(proteger múltiples)**.

Conclusión: Todas las trayectorias de trayectoria múltiple se instalan en la RIB. Otra ruta de acceso se instala como una ruta de respaldo (la ruta de **respaldo(proteger múltiples rutas)**). Sólo se anuncia la mejor trayectoria.

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 las trayectorias anunciadas:

```
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
```

- Hay tres trayectorias multirruta.
- Hay una ruta de "copia de seguridad(protección de múltiples rutas)". Ésta es la trayectoria de respaldo instalada en la tabla RIB/CEF.

- El quinto trayecto no está marcado.
- Se anuncian la mejor trayectoria y la trayectoria de respaldo.

Es posible que no haya una ruta de **copia de seguridad (proteger múltiples rutas)**. Por ejemplo, si hay **trayectorias máximas BGP** *2* configuradas y sólo se reciben 2 trayectorias, entonces dos trayectorias son múltiples y no hay **trayectoria de respaldo(proteger múltiples)**.

Esta trayectoria de respaldo anunciada es una de las trayectorias de trayecto múltiple (marcada como respaldo en la tabla BGP).

Esto es con **maximum-paths ibgp 1**:

```
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 las trayectorias anunciadas:

```
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
```

- No hay ECMP en RR.
- La segunda mejor trayectoria es la trayectoria de respaldo. Se instala en la tabla RIB/CEF.
- Se anuncia la mejor trayectoria y trayectoria de respaldo.
- No hay ninguna ruta de **respaldo(proteger múltiples rutas)**.

Conclusión: Todas las trayectorias de trayectoria múltiple se instalan en la RIB. Otra trayectoria se instala como ruta de respaldo. Se anuncian la mejor trayectoria y la trayectoria de respaldo.

9. set path-select group-best advertise

- Group-best sólo se puede utilizar con **publicidad**.
- La mejor selección del grupo es la mejor trayectoria por AS (Sistema Autónomo) y también por salto siguiente.
- El prefijo se origina en diferentes sistemas autónomos.

Para este caso se utiliza una topología diferente. Los routers son los mismos que en la imagen 1, pero PE4 está ahora en AS 65004 y PE5 está en AS 65005. El resto de los routers todavía están en AS 65000.
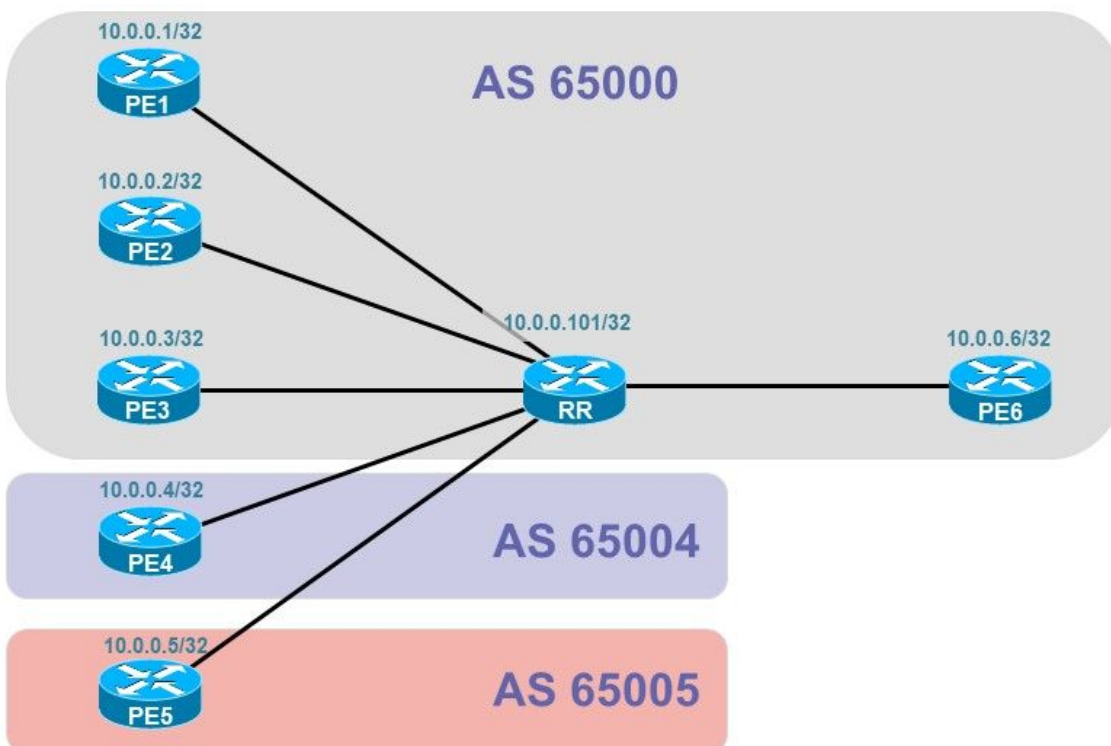

Imagen 2

Esto significa que ahora hay una sesión eBGP entre el RR y PE4 y entre el RR y PE5.

```
route-policy BGP-Path-Selection
 set path-selection group-best 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
   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}
```
El RR aún tiene tres trayectorias ECMP instaladas en la tabla RIB y 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
```

RR anuncia la mejor trayectoria del grupo desde las tres trayectorias recibidas desde AS 65000. Además de esta trayectoria, el RR también anuncia la mejor trayectoria de grupo recibida del AS 65004 y la del AS 65005.

Hay tres trayectorias mejores del grupo porque las tres trayectorias tienen un AS vecino diferente. Todas estas trayectorias se anuncian. Las trayectorias de trayectoria múltiple no se anuncian.

Conclusión: Se anuncian todas las trayectorias mejores del grupo.

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

Esta opción sólo está disponible a partir de Cisco IOS®-XR 7.3.1.

Para comenzar con Cisco IOS®-XR 7.3.1, hay una nueva palabra clave **multipath-Protect-advertise**.

Esto permite que la trayectoria **multi-path-Protect** se anuncie **junto con la trayectoria de respaldo**. Antes de Cisco IOS®-XR 7.3.1, la ruta **multi-path-Protect** estaba instalada pero no anunciada. (Véase el 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 las trayectorias anunciadas:

```
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
```

Conclusión: Todas las trayectorias de trayectoria múltiple se instalan en la RIB. Otra trayectoria - backup(Protect multipath)- se instala como una trayectoria de respaldo. Se anuncia la mejor trayectoria, la trayectoria de respaldo y la ruta de respaldo(proteger múltiples rutas).

11. set path-select multipath advertise multipath-Protect

Esta opción sólo está disponible a partir de 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 Gi0/0/0/0    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 las trayectorias anunciadas:

```
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
```

- El tercer trayecto es el trayecto de respaldo. Se marca como backup(Protect multipath) en BGP e instalado como una trayectoria de respaldo en el RIB.
- Se anuncian la mejor trayectoria y las trayectorias de trayectoria múltiple.
- No se anuncia la ruta de "copia de seguridad(protección de múltiples rutas)".

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

Esto permite que la trayectoria multi-path-Protect se instale y anuncie junto con las trayectorias multipath.

```
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 las trayectorias anunciadas:

```
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
```

Conclusión:

- Las 3 trayectorias se marcan como múltiples trayectorias en BGP.
- 3 Las trayectorias ECMP se instalan en la tabla RIB/CEF.
- La segunda trayectoria es la trayectoria de respaldo. Marcado como respaldo(proteger múltiples rutas) en BGP e instalado como una trayectoria de respaldo en la tabla RIB/CEF.
- Se anuncian la mejor ruta y las rutas de múltiples rutas y las rutas de 'backup(Protect multipath)'.

Comportamiento de selección de ruta nueva a partir de Cisco IOS®-XR 7.3.1

A partir de Cisco IOS®-XR 7.3.1, esto ha cambiado:

- Es posible seleccionar la ruta por vecino. Antes de Cisco IOS®-XR 7.3.1, esto era sólo por familia de direcciones.
- Se permiten varias sentencias set path-select en una política de ruta.
- Las trayectorias BGP se pueden mostrar en el orden en que se reciben.

La selección de ruta por vecino es posible

Esta es la selección de trayectoria disponible en una política de ruta:

```
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
```

La **mejor trayectoria** es la predeterminada.

Esto se admite en el nivel de familia de direcciones.

Ejemplo de configuración:

```
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 comenzar con Cisco IOS®-XR 7.3.1, algunas opciones de selección de trayectoria en una política de ruta también se soportan en el nivel de vecino. Esto lleva a un control más granular sobre qué trayectorias se anuncian a qué vecinos BGP. Como ejemplo, un altavoz BGP podría anunciar la mejor trayectoria y una trayectoria de respaldo a un vecino BGP, pero anunciar la trayectoria múltiple y proteger la trayectoria múltiple a otro vecino.

En el nivel vecino, hay:

```
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
```

> **Advertencia:** La mejor trayectoria es multipath si el comando BGP **maximum-path** está configurado. Sin embargo, si la única condición configurada en la política de ruta es **is-multi-path**, sólo se anuncian las trayectorias de trayectoria múltiple que no son la mejor trayectoria. Depende del diseño BGP, pero es probable que si las trayectorias de trayectoria múltiple se deben anunciar, también se debería anunciar la mejor trayectoria.

El **is-all** y **is-multipath-Protect** se presentan recientemente con Cisco IOS®-XR 7.3.1.

Se permiten varias sentencias set path-Selection en una política de ruta

A partir de Cisco IOS®-XR 7.3.1, puede tener instrucciones **multipleset path-select** en una política de ruta relacionada con un prefijo. Antes de Cisco IOS®-XR 7.3.1, esto no estaba permitido y llevaría a un comportamiento de trayectoria BGP impredecible.

Tener más de una selección de trayectoria o no se ve por prefijo.

Por ejemplo, **antes de** Cisco IOS®-XR 7.3.1, no se admite lo siguiente:

```
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
```

Tiene dos instrucciones **set path-select** en una política de ruta aplicada a los mismos prefijos.

Sin embargo, <u>antes de Cisco IOS®-XR 7.3.1</u>, se soporta lo siguiente. La razón es que las diferentes sentencias de selección de trayectoria son para diferentes prefijos, porque **si** se utilizan instrucciones con una selección (destino, comunidad, ...).

Ejemplo 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
```

Esto es bueno, ya que las sentencias **de selección de set-path** se relacionan con diferentes prefijos (están en dos **si** instrucciones **diferentes**).

Ejemplo 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
```

Esto es bueno, ya que las sentencias de selección de trayectoria de conjunto se relacionan con diferentes prefijos (están en dos partes diferentes de la instrucción **if**).

A partir de Cisco IOS®-XR 7.3.1, esto es soportado.

Este es un ejemplo de una política de ruta con más de una instrucción **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
!
```

La política de ruta por vecino especifica qué trayectorias se anuncian a ese vecino. Cualquier trayectoria sólo se puede elegir entre las trayectorias ya marcadas en el nivel de familia de direcciones.

En el nivel de familia de direcciones, tiene la selección de ruta:

```
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
```
En el nivel vecino, hay:


```
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
```

> **Advertencia:** La mejor trayectoria es multipath si el comando BGP **maximum-path** está configurado. Sin embargo, si la única condición configurada en la política de ruta es **is-multi-path**, sólo se anuncian las trayectorias de trayectoria múltiple que no son la mejor trayectoria. Depende del diseño BGP, pero es probable que si las trayectorias de trayectoria múltiple se deben anunciar, también se debería anunciar la mejor trayectoria.

El **is-all** y **is-multipath-Protect** se presentan recientemente con Cisco IOS®-XR 7.3.1.

Con este enfoque, la **marcación** de la selección de la ruta puede ser una combinación de los modos de selección de la ruta que tiene (por ejemplo, todos los modos de copia de seguridad, múltiples rutas, multipath-Protect, etc.).

La política de vecino controla el **anuncio** basándose en el marcado de selección de ruta.

Para la parte de marcado: por ejemplo, puede tener una copia de seguridad y una ruta múltiple configuradas juntas en la política de ruta en el nivel de familia de direcciones:


```
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
!
```
Las dos sentencias set path-Selection anteriores son las que se admiten recientemente a partir de Cisco IOS®-XR 7.3.1. Con maximum-path ibgp 3 todavía configurado en el ejemplo, tiene lo siguiente:

- Permite que se anuncien la mejor trayectoria y todas las trayectorias múltiples.
- Permite que se anuncie la mejor trayectoria y la ruta de respaldo (proteger múltiples rutas).

Esta combinación no era posible antes de Cisco IOS®-XR 7.3.1. Esto significa que estarían en vigor los apartados 1 y 2.

Este es el 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 las trayectorias anunciadas:

```
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
```

Ahora es posible anunciar a un vecino las trayectorias principales (mejor trayectoria) y de respaldo, en base a *is-best-path o is-backup-path*.

Para otro vecino, el trayecto múltiple se puede anunciar con **is-multi-path**.

Ejemplo de política de ruta de vecino (utilizada con la política de ruta en el nivel de familia de direcciones):

```
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
!
```

Si el RR tiene estas trayectorias 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
```

Luego para la primera trayectoria de la política de ruta de vecino, que es la siguiente:

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

El PE6 vecino recibe estas trayectorias:

```
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
```

Estas dos trayectorias son la mejor trayectoria y la trayectoria de respaldo en RR.

Para la segunda parte de la política de ruta de vecino, que es la siguiente:

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

El PE6 vecino recibe estas trayectorias:

```
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
```

Estas trayectorias son las trayectorias de trayectoria múltiple (pero **no** incluye la mejor trayectoria!) y la trayectoria de respaldo (proteger múltiples rutas).

Mostrar las Trayectorias BGP en el Orden en que se Reciben

Las trayectorias BGP se muestran en orden lexicográfico.

Un nuevo comando -introducido en Cisco IOS®-XR 7.3.1- se puede utilizar para ver las trayectorias BGP en el orden en que se recibieron:

```
show bgp <afi> rd <rd> <path_details> <age-order>
```
Este comando es útil para ver por qué las trayectorias fueron marcadas como trayecto múltiple. Las trayectorias recibidas anteriormente se marcan como trayecto múltiple y se instalan en el RIB como rutas de trayecto máximo. El comando **show route** muestra la palabra clave **BGP multi path** para las rutas instaladas como tales.

Para verificar qué trayectoria está marcada como multitrayectoria, el nuevo comando puede ser utilizado para verificar el orden en que se recibieron todas las trayectorias. Las rutas más recientes se encuentran en la parte superior del resultado.

Por ejemplo, con la siguiente configuración:

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

No hay cambios en el proceso de decisión de la mejor trayectoria, ni las trayectorias tienen atributos (como preferencia local) que afecten al proceso de decisión de la mejor trayectoria.

El RR tiene esta selección de trayectoria 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 qué el trayecto desde 10.0.0.1 es el mejor trayecto? ¿Por qué el trayecto desde 10.0.0.2 es el trayecto de respaldo? ¿Por qué la trayectoria de 10.0.0.3 es multitrayectoria? ¿Por qué la trayectoria de 10.0.0.4 es la copia de seguridad(proteger múltiples rutas)? ¿Por qué la trayectoria de 10.0.0.5 no es la mejor trayectoria, no la trayectoria múltiple, y no la ruta de respaldo (proteger trayecto múltiple)?

Puede ver esto con el mismo comando con **orden de edad** al final. Las rutas más recientes se encuentran en la parte superior del resultado.

```
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
```

Puede utilizar los comandos show bgp con la palabra clave bestpath-compare para verificar por qué una trayectoria no es la mejor trayectoria (se muestra una razón por trayectoria).

```
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
```
Dado que la mayoría de los atributos en las trayectorias BGP son iguales entre las trayectorias, la
decisión de elegir la mejor trayectoria se redujo al ID de router más bajo del altavoz BGP. Aquí
está el altavoz BGP 10.0.0.1. El trayecto de respaldo es el segundo mejor trayecto, por lo tanto el
segundo ID de router más bajo del altavoz BGP. Aquí está 10.0.0.2.

Las trayectorias de 10.0.0.4 y 10.0.0.5 no son trayectorias de trayectoria múltiple porque se instalaron después que las trayectorias de 10.0.0.1, 10.0.0.2 y 10.0.0.3.

Ruta de copia de seguridad frente a copia de seguridad (proteger múltiples rutas)

```
route-policy BGP-Path-Selection
  set path-selection multipath advertise
  set path-selection backup 1 install multipath-protect advertise multipath-protect-advertise
end-policy
!
```
Se ha configurado el ibgp de ruta máxima 3.

La copia de seguridad es la segunda mejor trayectoria. Aquí, las trayectorias de trayectoria múltiple se recibieron antes de la trayectoria de respaldo. Por lo tanto, hay tres trayectorias múltiples y otra es una trayectoria de respaldo.

```
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
```

Cierre el vecino 10.0.0.5. Ahora tiene:

```
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
```

- El trayecto de 10.0.0.5 desapareció.
- La trayectoria de 10.0.0.2 sigue siendo una copia de seguridad, pero ahora también es una trayectoria múltiple.
- Debido a que la trayectoria de respaldo es también una trayectoria de múltiples rutas, ahora tiene una trayectoria de respaldo (proteger múltiples rutas). Ésta es la trayectoria de 10.0.0.4.

Desconecte el vecino 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 ha cambiado a las 4 rutas instaladas anteriormente. Sólo se agregó la trayectoria de 10.0.0.5. Se encuentra en la parte superior porque es más reciente. No es un trayecto múltiple o cualquier tipo de trayecto de respaldo.

La trayectoria de 10.0.0.5 ha cambiado de múltiples trayectorias a no múltiples después de un cambio de estado en la trayectoria.

Conclusión:

- El orden en el que se reciben las trayectorias juega un papel a la hora de determinar qué trayectorias son múltiples.

- El orden en el que se reciben las trayectorias juega un papel si hay o no una trayectoria de respaldo (proteger múltiples rutas).
- El orden en el que se reciben las trayectorias no juega un rol en el que se elija la trayectoria como la mejor trayectoria o trayectoria de respaldo.

Pedido por métrica IGP

Existe la opción de solicitar las rutas de acceso múltiple por cada métrica de protocolo de gateway interior (IGP).

```
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#
```

El costo desigual es necesario de la misma manera que de lo contrario, usted termina con sólo la mejor trayectoria, una trayectoria de respaldo, pero no con múltiples trayectorias porque múltiples trayectorias necesitan que el mismo costo IGP se considere trayecto múltiple.

El costo IGP de RR a los routers PE se cambia en la topología. El costo IGP se configura de la siguiente manera:

- RR a PE1: 5
- RR a PE2: 4
- RR a PE3: 3
- RR a PE4: 2
- RR a PE5: 1

Todavía hay estos:

```
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 de que cambie la métrica IGP (el costo es el mismo en todos los 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
```

Después del cambio de 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
```

- La mejor trayectoria es ahora la trayectoria desde 10.0.0.5 debido a la métrica IGP más baja (métrica 2).
- El trayecto de respaldo es ahora el trayecto con la segunda mejor métrica IGP, el trayecto desde 10.0.0.4 (métrica 3).
- La mejor trayectoria y trayectoria de respaldo también son múltiples rutas, por lo que queda por elegir una trayectoria múltiple. Ésta es la trayectoria desde 10.0.0.3 (métrica 4).
- La ruta de acceso de respaldo (proteger múltiples rutas) es la ruta de 10.0.0.2 (métrica 5).
- Finalmente, la trayectoria desde 10.0.0.1 (métrica 6) no está marcada en absoluto, porque tiene la peor métrica.