

# Configurazione e verifica della selezione del percorso BGP in IOS-XR

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## Introduzione

Questo documento descrive l'istruzione **set path-selection** in una policy delle route per Border Gateway Protocol (BGP) in Cisco IOS®-XR.

## Premesse

In molti progetti, BGP seleziona e annuncia più percorsi per un prefisso.

Per impostazione predefinita, viene selezionato un solo percorso BGP come miglior percorso e viene annunciato solo questo percorso. L'algoritmo di selezione del miglior percorso BGP decide quanto segue:

[Algoritmo di selezione del miglior percorso BGP](#)

Oltre al percorso migliore, è possibile scegliere un secondo percorso migliore come percorso di

backup. Questo percorso di backup può essere utilizzato nelle progettazioni con BGP PIC (Prefix Independent Convergence).

BGP consente di installare più percorsi per ottenere il bilanciamento del carico. Può trattarsi del bilanciamento del carico Equal Cost Multipath (ECMP) o di un percorso diverso per i costi (UCMP). Questi percorsi multipli vengono installati nella tabella di routing (RIB) e nella tabella Piano dati (Data plane) o FIB (Forwarding Instance Base) per ottenere il bilanciamento del carico. La tabella FIB è nota anche come tabella CEF (Cisco Express Forwarding).

Questo articolo si concentra su due obiettivi:

- Come fare in modo che BGP scelga più percorsi da installare?
- Come fare in modo che BGP annunci più percorsi?

Un'altra funzionalità utilizzata da BGP è rappresentata dai percorsi aggiuntivi (ADD-Paths). Questa funzionalità consente a BGP di annunciare più percorsi su una sessione BGP.

## Riepilogo

- Il percorso migliore viene sempre scelto da BGP. In caso contrario, c'è qualcosa che non va. Il presente articolo non tratta tali scenari.
- Se è stata configurata una funzionalità specifica, è possibile scegliere un percorso di backup (ad esempio, BGP PIC).
- È possibile configurare una route-policy in una specifica famiglia di indirizzi affinché BGP selezioni i percorsi da installare e/o pubblicizzare.
- Prima di Cisco IOS®-XR 7.3.1, è supportata solo un'istruzione **set path-selection** nei criteri di routing per la selezione di percorsi per un prefisso specifico.
- Per iniziare con Cisco IOS® XR 7.3.1, è possibile usare istruzioni **set path-selection** multiple nella policy di routing per selezionare i percorsi di un prefisso specifico.
- A partire da Cisco IOS®-XR 7.3.1, è stata aggiunta una funzionalità che consente di utilizzare una policy di routing per annunciare percorsi specifici di un prefisso BGP a un router adiacente BGP.

La selezione dei percorsi multipath da parte di BGP viene eseguita per ricevere i percorsi. Tuttavia, i comandi **show bgp** mostrano i percorsi BGP in ordine lessicografico.

Un nuovo comando -introdotto in Cisco IOS®-XR 7.3.1- può essere usato per visualizzare i percorsi BGP nell'ordine in cui sono stati ricevuti:

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

In questo modo è possibile verificare e risolvere i problemi di multipath. Risolve la questione principale del perché un percorso viene scelto come percorso multiplo e non come un altro.

Un percorso di protezione a percorsi multipli è un percorso di backup che non è un percorso a percorsi multipli ma protegge tutti gli altri percorsi a percorsi multipli.

A partire da Cisco IOS®-XR 7.3.1, è disponibile questa nuova parola chiave **multipath-protect-**

**advertising** per l'istruzione **set path-selection**. Può essere utilizzato per annunciare il percorso di protezione a percorsi multipli **lungo il percorso di backup** o **lungo i percorsi a percorsi multipli**. I comandi completi da utilizzare nei criteri di route sono:

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

Questa è una panoramica del comando **set path-selection** con tutte le relative combinazioni di parole chiave. Una spiegazione più dettagliata ed esempi sono riportati nella sezione successiva.

In tutti i casi riportati di seguito, viene installato il percorso migliore. In caso contrario, si è verificato un errore (ad esempio, se l'hop successivo non è valido), ma questo problema non è correlato al comando **set path-selection**.

Per selezionare il percorso di backup, è necessario abilitare una funzionalità per BGP che consenta di selezionare un percorso di backup BGP: ad esempio BGP PIC.

I percorsi a percorsi multipli vengono abilitati in BGP dal comando **maximum-path** della famiglia di indirizzi:

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

Per definizione, il percorso migliore è un percorso a percorsi multipli. Il percorso migliore è l'unico percorso installato nella tabella di routing se non è abilitato Multipath per BGP. È possibile controllare il numero di percorsi BGP installati nella tabella di routing con il comando **maximum-paths {ebgp | eibgp | ibgp} <2-32> (costo disuguale)**.

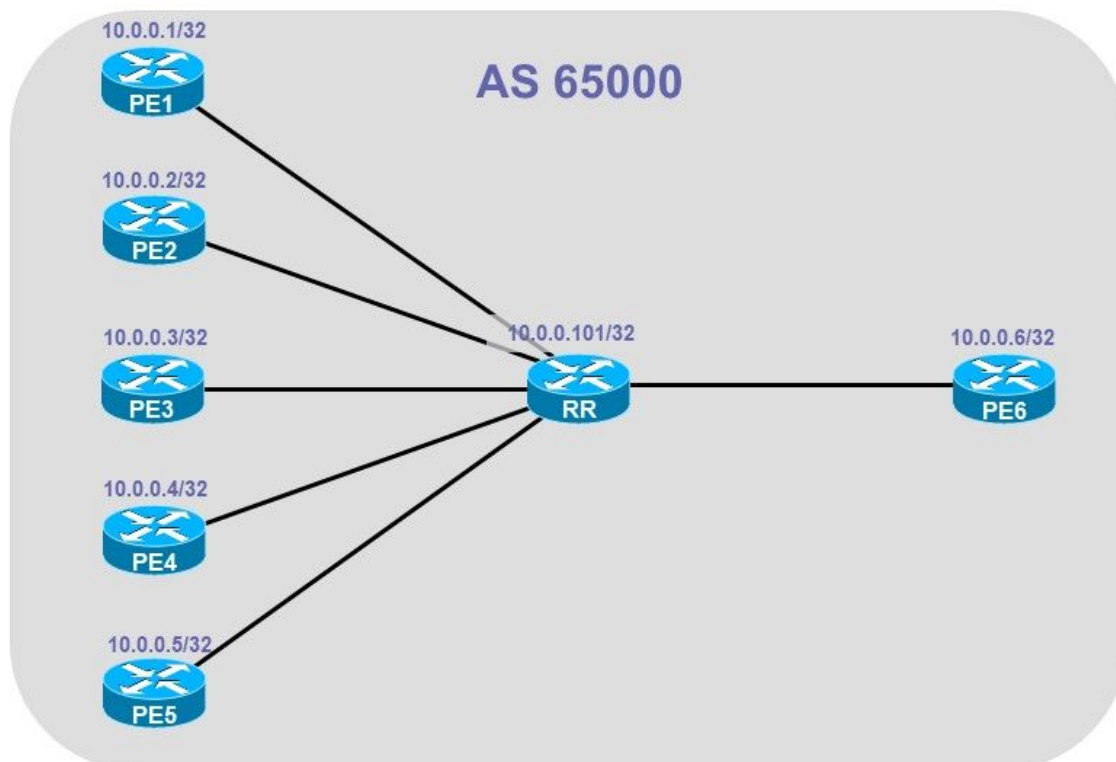
In questa tabella viene fornita una panoramica di tutte le opzioni con il comando **set path-selection**. Per ulteriori dettagli ed esempi, fare riferimento alla sezione successiva in ciascuna richiesta presentata qui.

Case	Comando	Install	Publicizza
1	set path-selection backup 1 install	1 percorso di backup installato.	Viene annunciato solo il percorso migliore.
2	set path-selection backup 1 annuncio	Percorso di backup non installato.	Il percorso di backup non è annunciato.
3	set path-selection backup 1 annuncio installazione	Il percorso di backup è installato.	Il percorso di backup è annunciato.
4	set path-selection all annuncio	Percorso di backup non installato. I percorsi a percorsi multipli vengono installati.	Tutti i percorsi vengono annunciati (percorso migliore, percorso di backup, percorso multipath, percorso non multipath).
5	set path-selection best-path	I percorsi a percorsi multipli vengono installati.	Viene annunciato solo il percorso migliore.

6	set path-selection multipath annuncio	I percorsi a percorsi multipli vengono installati.	I percorsi a percorsi multipli vengono annunciati.
7	set path-selection backup 1 install multipath-protect	I percorsi a percorsi multipli vengono installati. Un altro percorso viene installato come percorso di backup (il percorso 'backup(protect multipath)' se vi sono ancora percorsi accanto ai percorsi multipath.	Viene annunciato solo il percorso migliore.
8	set path-selection backup 1 install multipath-protect annuncio	I percorsi a percorsi multipli vengono installati. Un altro percorso viene installato come percorso di backup (il percorso 'backup(protect multipath)' se vi sono ancora percorsi accanto ai percorsi multipath.	Vengono annunciati il percorso migliore e il percorso di backup. Il percorso di backup (protezione multipath) viene annunciato.
9	set path-selection group-best annuncio	La selezione migliore per gruppo è il percorso migliore per AS e anche per hop successivo. I percorsi a percorsi multipli vengono installati.	Vengono annunciati tutti i percorsi migliori del gruppo.
10	set path-selection backup 1 install multipath-protect annuncio multipath-protect-advertising	I percorsi a percorsi multipli vengono installati. Un altro percorso viene installato come percorso di backup (il percorso 'backup(protect multipath)' se vi sono ancora percorsi accanto ai percorsi multipath.	Vengono annunciati il percorso migliore, il percorso di backup e il percorso di backup (protezione multipath).
11	set path-selection multipath annuncio multipath-protect	I percorsi a percorsi multipli vengono installati.	I percorsi a percorsi multipli vengono annunciati. Il percorso di backup (protezione multipath) viene annunciato.
12	set path-selection multipath annuncio multipath-protect multipath-protect-advertising	I percorsi a percorsi multipli vengono installati. Un altro percorso viene installato come percorso di backup (il percorso 'backup(protect multipath)' se vi sono ancora percorsi	I percorsi a percorsi multipli vengono annunciati. Il percorso di backup (protezione multipath) viene annunciato.

accanto ai percorsi multipath.

Questa è la topologia utilizzata in questo documento.



In tutti i casi, ADD-PATH è abilitato tra RR (Route-Reflector) e PE6.

PE1, PE2, PE3, PE4, PE5 e PE6 annunciano tutti lo stesso prefisso della route unicast vpnv4 verso il record di risorse.

PE6 è il PE in entrata, che riceve questo prefisso dall'RR.

Se non specificato diversamente, ADD-PATH viene abilitato su ogni sessione BGP e i percorsi massimi ibgp 3 sono configurati sul router per la famiglia di indirizzi vpnv4 unicast.

**Nota:** Nelle tabelle RIB e CEF è installato al massimo un percorso di backup. Più di uno non è possibile/supportato. Il percorso viene contrassegnato come backup nella tabella BGP, nella tabella RIB e nella tabella CEF.

La route di backup viene sempre scelta da BGP in questo articolo. Un percorso di backup potrebbe essere scelto da un'altra funzionalità, ma in questo caso si tratta sempre di BGP.

Se per BGP è configurato il multipath, è possibile installare percorsi multipath (ECMP o UCMP)

nella tabella BGP. Sono contrassegnati con **percorsi multipli**. Il percorso di backup è il secondo miglior percorso, quindi dovrebbe essere uno dei percorsi a percorsi multipli, se presenti. Ciò significa che è possibile scegliere un backup (proteggi multipath) da BGP se questa funzionalità è configurata (la parola chiave **multipath-protect** nell'istruzione **set path-selection route-policy**). In questo caso, il percorso di **backup (protezione multipath)** è il percorso di backup nella tabella RIB e CEF. Il percorso di **backup** scelto da BGP e contrassegnato come tale da BGP non è quindi un percorso di backup, ma semplicemente un percorso a percorsi multipli.

Un percorso di backup su un record di risorse non ha molto senso se tale record ha solo il ruolo di un record di risorse.

In questo articolo si presume che il router sia anche un router PE. In tal caso, è opportuno selezionare e installare una route di backup. La route di backup potrebbe essere utilizzata per BGP PIC.

Una route di backup è contrassegnata con **backup** nella RIB quando si specifica il prefisso specifico o con **!** se non si specifica il prefisso.

```
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
```

## Impostare i comandi di selezione dei percorsi nei criteri di route

In questa sezione vengono descritte tutte le istruzioni **set path-selection** utilizzate nei criteri di routing per la famiglia di indirizzi specifica del router BGP.

A prescindere dal fatto che la versione Cisco IOS®-XR sia precedente o successiva a Cisco IOS®-XR 7.3.1.

Configurazione:

```
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
!
!
!

```

I criteri di route con le istruzioni set path-selection vengono applicati nella famiglia di indirizzi unicast vpnv4.

La route-policy con le istruzioni set path-selection viene applicata anche al VRF. Questa operazione è necessaria se è necessario installare una route di backup nella tabella VRF RIB/CEF (o pubblicizzata sulla sessione BGP tramite il collegamento PE-CE).

In questo caso, entrambe le policy di route sono identiche, ma è possibile applicarne di diverse nell'ambito della famiglia di indirizzi rispetto al VRF.

**Maximum-path ibgp 3** viene utilizzato in VRF 1, specificando che nella tabella RIB/CEF possono essere presenti fino a tre percorsi ECMP.

Questi casi mostrano tutte le possibilità per la route-policy con **set path-selection**.

## 1. set path-selection 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}
```

Verificare i percorsi annunciati:

```
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
```

Conclusione: Nel server di report remoto del VRF è installato 1 percorso di backup. Viene annunciato solo il percorso migliore.

## 2. set path-selection backup 1 annuncio

```
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}

Verificare i percorsi annunciati:

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
```

Conclusione: Route di backup non installata. Il percorso di backup viene annunciato.

### 3. set path-selection backup 1 annuncio installazione

```
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}

```

## Verificare i percorsi annunciati:

```
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

**Conclusion: Route di backup installata. Il percorso di backup viene annunciato. Questo è 1. e 2.**

## 4. set path-selection all annuncio

```

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}
```

## Verificare i percorsi annunciati:

```
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

```

Conclusione: Route di backup non installata. Tutti (5) i percorsi vengono pubblicizzati.

## 5. set path-selection best-path

```

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

```

```

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

```

```

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions: Process          bRIB/RIB  SendTblVer
  Speaker                5          5
Last Modified: Sep 17 15:34:15.907 for 00:00:09
Paths: (5 available, best #1)
  Advertised to update-groups (with more than one peer):
    0.2 0.3
  Path #1: Received by speaker 0
  Advertised to update-groups (with more than one peer):
    0.2 0.3
  Local, (Received from a RR-client)
    10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
     Received Label 24012
     Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
     Received Path ID 0, Local Path ID 1, version 5
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
  Path #2: Received by speaker 0

```

```

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

```

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

Routing entry for 10.1.1.1/32

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

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

Routing Descriptor Blocks

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

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

Route metric is 0

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

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

Route metric is 0

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

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

Route metric is 0

No advertising protos.

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

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

Updated Sep 17 15:34:16.313

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

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

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

recursion-via-/32

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

```

next hop 10.0.0.1/32 via 24003/0/21
  next hop 10.1.101.1/32 Gi0/0/0/0    labels imposed {ImplNull 24012}
via 10.0.0.2/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 1 NHID 0x0 [0xdab2e48 0x0]
  recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.2/32 via 24001/0/21
  next hop 10.2.101.2/32 Gi0/0/0/4    labels imposed {ImplNull 24012}
via 10.0.0.3/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
  path-idx 2 NHID 0x0 [0xdab2060 0x0]
  recursion-via-/32
next hop VRF - 'default', table - 0xe0000000
next hop 10.0.0.3/32 via 24007/0/21
  next hop 10.3.101.3/32 Gi0/0/0/6    labels imposed {ImplNull 24012}

```

Conclusione: Vengono installati solo il percorso migliore e i percorsi multipath. Viene annunciato solo il percorso migliore. Nessun percorso di backup selezionato, installato o annunciato.

## 6. set path-selection multipath annuncio

Annuncio è una parola chiave obbligatoria.

```

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

```

Affinché questa operazione funzioni, è necessario che per BGP sia abilitato il multipath per la famiglia di indirizzi specifica.

In questo caso, è abilitato il multipath per il protocollo unicast ipv4 in VRF one.

```

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}

```

## Verificare i percorsi annunciati:

```
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

- I percorsi vpnv4 sono contrassegnati con multipath.
- I 3 percorsi multipath vengono installati nel RIB.

- Vengono annunciati i 3 percorsi a percorsi multipli.
- Nessun percorso di backup.

Conclusione: I percorsi a percorsi multipli vengono installati nel RIB e annunciati. Nessun backup selezionato, installato o annunciato.

## 7. set path-selection 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}
```

Verificare i percorsi annunciati:



```
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
```

Potrebbe non essere presente un percorso di **backup (protezione multipath)**. Ad esempio, se sono presenti **percorsi massimi BGP 2** configurati e vengono ricevuti solo 2 percorsi, due percorsi sono a percorsi multipli e non è presente alcun percorso di **backup (protezione a percorsi multipli)**.

Conclusione: Tutti i percorsi multipath vengono installati nel RIB. Un altro percorso viene installato come percorso di backup (percorso di **backup (protezione multipath)**). Viene annunciato solo il percorso migliore.

## 8. set path-selection backup 1 install multipath-protect annuncio

```
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}

```

### Verificare i percorsi annunciati:

```
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

- Sono disponibili tre percorsi a percorsi multipli.
- È disponibile un percorso di backup (protezione multipath). Percorso di backup installato nella tabella RIB/CEF.
- Il quinto percorso non è contrassegnato.

- Vengono annunciati il percorso migliore e il percorso di backup.

Potrebbe non essere presente un percorso di **backup (protezione multipath)**. Ad esempio, se sono configurati i **percorsi massimi BGP 2** e vengono ricevuti solo 2 percorsi, due percorsi sono a percorsi multipli e non è presente alcun percorso di **backup (protezione a percorsi multipli)**.

Il percorso di backup annunciato è uno dei percorsi a percorsi multipli (contrassegnato come backup nella tabella BGP).

Ciò è possibile 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}

Verificare i percorsi annunciati:

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

```

- Nessun ECMP su RR.
- Il secondo miglior percorso è il percorso di backup. È installato nella tabella RIB/CEF.
- Vengono annunciati il percorso e il percorso di backup migliori.
- Nessun percorso di **backup (protezione multipath)**.

Conclusione: Tutti i percorsi multipath vengono installati nel RIB. Un altro percorso viene installato come percorso di backup. Vengono annunciati il percorso migliore e il percorso di backup.

## 9. set path-selection group-best annuncio

- Group-Best può essere utilizzato solo con l'annuncio.
- La selezione migliore per gruppo è il percorso migliore per AS (Autonomous System) e anche per hop successivo.
- Il prefisso ha origine da sistemi autonomi diversi.

In questo caso viene utilizzata una topologia diversa. I router sono uguali a quelli dell'immagine 1, ma PE4 si trova ora in AS 65004 e PE5 in AS 65005. Tutti gli altri router si trovano ancora in AS 65000.

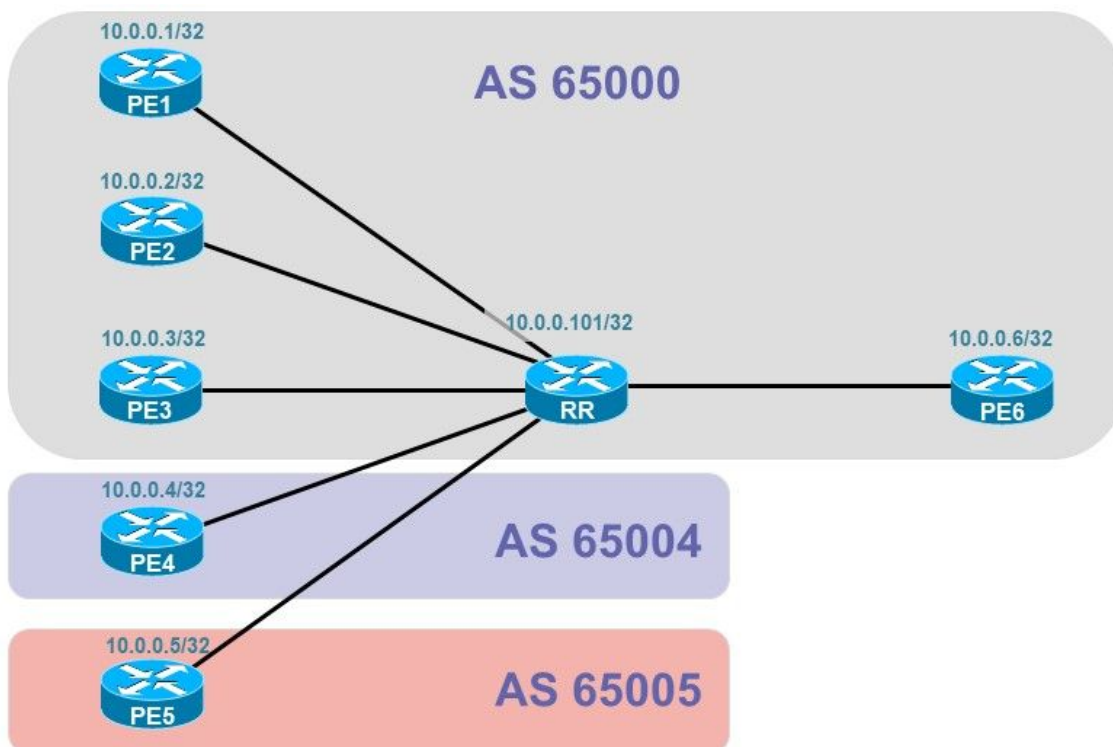


Immagine 2

Ciò significa che è ora disponibile una sessione eBGP tra RR e PE4 e tra RR e 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}

Nella tabella RIB e CEF sono ancora installati tre percorsi ECMP.

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 annuncia il percorso migliore del gruppo dai tre percorsi ricevuti da AS 65000. Oltre a questo percorso, RR annuncia anche il percorso migliore del gruppo ricevuto da AS 65004 e quello da AS 65005.

Sono disponibili tre percorsi migliori di gruppo, in quanto i tre percorsi hanno un'associazione di protezione adiacente diversa. Tutti questi percorsi vengono pubblicizzati. I percorsi a percorsi multipli non vengono annunciati.

Conclusione: Vengono annunciati tutti i percorsi migliori del gruppo.

## 10. set path-selection backup 1 install multipath-protect annuncio multipath-protect-advertising

Questa opzione è disponibile solo a partire da Cisco IOS®-XR 7.3.1.

Per iniziare con Cisco IOS®-XR 7.3.1, è disponibile una nuova parola chiave **multipath-protect-advertising**.

In questo modo, il percorso **multi-path-protect** viene annunciato **insieme al percorso di backup**. Prima di Cisco IOS®-XR 7.3.1, il percorso **multi-path-protect** era installato ma non annunciato. (Cfr. 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}
```

Verificare i percorsi annunciati:

```
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

```

Conclusione: Tutti i percorsi multipath vengono installati nel RIB. Un altro percorso **-percorso di backup (protezione multipath)-** viene installato come percorso di backup. Vengono annunciati il percorso migliore, il percorso di backup e il percorso di **backup (protezione multipath)**.

## 11. set path-selection multipath advertising multipath-protect

Questa opzione è disponibile solo a partire da 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}

## Verificare i percorsi annunciati:

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

- Il terzo percorso è il percorso di backup. È contrassegnato come backup (protect multipath) in BGP e installato come percorso di backup nel RIB.
- Vengono annunciati il percorso migliore e i percorsi multipath.
- Il percorso di backup (protezione multipath) non viene annunciato.

## 12. set path-selection multipath advertising multipath-protect multipath-protect-advertising

In questo modo, il percorso di protezione da percorsi multipli può essere installato e annunciato insieme ai percorsi a percorsi multipli.

```
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 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}

```

## Verificare i percorsi annunciati:

```
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
```

## Conclusione:

- Tutti e 3 i percorsi sono contrassegnati come multipath in BGP.
- 3 I percorsi ECMP vengono installati nella tabella RIB/CEF.
- Il secondo percorso è il percorso di backup. Contrassegnato come backup (protegge percorsi multipli) in BGP e installato come percorso di backup nella tabella RIB/CEF.
- Vengono annunciati il miglior percorso e i percorsi multipath e i percorsi di backup (protezione multipath).

## Nuovo comportamento di selezione del percorso di Cisco IOS®-XR 7.3.1

A partire dalla versione Cisco IOS®-XR 7.3.1, questa versione è cambiata:

- È possibile selezionare il percorso per router adiacente. Prima di Cisco IOS®-XR 7.3.1, questo era solo per famiglia di indirizzi.
- In un criterio di route sono consentite più istruzioni set path-selection.
- I percorsi BGP possono essere visualizzati nell'ordine in cui vengono ricevuti.

### È possibile selezionare per percorso adiacente

Questa è la selezione del percorso disponibile in un criterio di route:

```
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
```

**Il miglior percorso è quello predefinito.**

Ciò è supportato a livello di famiglia di indirizzi.

Esempio di configurazione:

```
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
!
!
!

```

Per iniziare con Cisco IOS®-XR 7.3.1, alcune opzioni di selezione dei percorsi in una policy di routing sono supportate anche a livello di router adiacente. Questo porta a un controllo più granulare su quali percorsi vengono annunciati a quali router BGP adiacenti. Ad esempio, un altoparlante BGP potrebbe annunciare il percorso migliore e un percorso di backup a un router BGP adiacente, ma annunciare il percorso multipath e proteggere il percorso multipath a un altro router adiacente.

A livello di sistema adiacente, sono presenti:

```

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

```

**Avviso:** Se il comando BGP **maximum-path** è configurato, il percorso migliore è multipath. Tuttavia, se l'unica condizione configurata nella route-policy è **is-multi-path**, vengono annunciati solo i percorsi multipath che non sono il percorso migliore. Dipende dal progetto BGP, ma è probabile che se i percorsi multipath devono essere annunciati, allora anche il percorso migliore deve essere annunciato.

Le nuove funzionalità **is-all** e **is-multipath-protect** sono state introdotte con Cisco IOS®-XR 7.3.1.

## In un criterio di route sono consentite più istruzioni set path-selection

A partire dalla versione Cisco IOS®-XR 7.3.1, è possibile avere **più istruzioni di selezione dei percorsi** in una policy di routing correlata a un prefisso. Prima di Cisco IOS®-XR 7.3.1, questa condizione non era consentita e avrebbe comportato un comportamento imprevedibile del percorso BGP.

La presenza o meno di più di una selezione di tracciati viene analizzata per prefisso.

Ad esempio, **prima di** Cisco IOS®-XR 7.3.1, quanto segue non è supportato:

```

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

```

Sono disponibili due istruzioni **set path-selection** in un criterio di route applicato agli stessi prefissi.

Tuttavia, **prima di Cisco IOS®-XR 7.3.1**, è supportato quanto segue. Il motivo è che le diverse istruzioni di selezione del percorso sono per prefissi diversi, perché **se** vengono utilizzate istruzioni con una selezione (destinazione, comunità, ...).

Esempio 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

```

Ciò è utile in quanto le istruzioni di **selezione set-path** si riferiscono a prefissi diversi (si trovano in due istruzioni **if** diverse).

Esempio 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

```

Ciò è utile in quanto le istruzioni **set path selection** si riferiscono a prefissi diversi (si trovano in due parti diverse dell'istruzione **if**).

**A partire da Cisco IOS®-XR 7.3.1**, questa versione è supportata.

Questo è un esempio di criteri di route con più istruzioni **set path-selection**:

```

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

```

Il criterio di route per router adiacenti specifica i percorsi annunciati per tale router adiacente. È possibile scegliere qualsiasi percorso solo tra quelli già contrassegnati a livello di famiglia di indirizzi.

A livello di famiglia di indirizzi, è possibile selezionare il percorso:

```
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
```

A livello di sistema adiacente, sono presenti:

```
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
```

**Avviso:** Se il comando BGP **maximum-path** è configurato, il percorso migliore è multipath. Tuttavia, se l'unica condizione configurata nella route-policy è **is-multi-path**, vengono annunciati solo i percorsi multipath che non sono il percorso migliore. Dipende dal progetto BGP, ma è probabile che se i percorsi multipath devono essere annunciati, allora anche il percorso migliore deve essere annunciato.

Le nuove funzionalità **is-all** e **is-multipath-protect** sono state introdotte con Cisco IOS®-XR 7.3.1.

Con questo approccio, il **contrassegno** della selezione del percorso può essere una combinazione delle modalità di selezione del percorso disponibili, ad esempio tutte, backup, multipath, multipath-protect e così via.

Il criterio del vicino controlla l'**annuncio** in base all'indicazione di selezione del percorso.

Per la parte marcatura: ad esempio, è possibile configurare contemporaneamente backup e percorsi multipli nella route-policy a livello di famiglia di indirizzi:

```
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
!
```

Le due istruzioni set path-selection di cui sopra sono le nuove supportate a partire da Cisco IOS®-XR 7.3.1. Con maximum-path ibgp 3 ancora configurato nell'esempio, è possibile:

- Consente di annunciare il miglior percorso e tutti i percorsi a percorsi multipli.
- Consente di annunciare il percorso migliore e il percorso di backup (protezione multipath).

Questa combinazione non era possibile prima di Cisco IOS®-XR 7.3.1. Ciò significa che (1) o (2) sarebbero in vigore.

Questo è il risultato:

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}

Verificare i percorsi annunciati:

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

```

È ora possibile annunciare a un router adiacente il percorso principale (percorso migliore) e il percorso di backup, in base al *percorso migliore* o al *percorso di backup*.

Per un altro router adiacente, il percorso multiplo può essere annunciato con **is-multi-path**.

Esempio di criteri di route dei router adiacenti (utilizzati con i criteri di route a livello di famiglia di indirizzi):

```

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

```



```
else
  drop
endif
end-policy
!
```

Se il record di risorse dispone dei seguenti percorsi 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
```

Quindi per il primo percorso della route-policy del router adiacente, ovvero:

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

Il router adiacente PE6 riceve i percorsi seguenti:

```
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
```

Questi due percorsi rappresentano il percorso migliore e il percorso di backup su RR.

Per la seconda parte della route-policy dei router adiacenti, ovvero:

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

Il router adiacente PE6 riceve i percorsi seguenti:

```
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

Questi percorsi sono i percorsi a percorsi multipli (**escluso** il percorso migliore!) e il percorso di backup (protezione a percorsi multipli).

## Mostra i percorsi BGP nell'ordine in cui vengono ricevuti

I percorsi BGP sono visualizzati in ordine lessicografico.

Un nuovo comando -introdotto in Cisco IOS®-XR 7.3.1- può essere usato per visualizzare i percorsi BGP nell'ordine in cui sono stati ricevuti:

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

Questo comando è utile per verificare perché i percorsi sono stati contrassegnati come percorsi multipli. I percorsi ricevuti in precedenza sono contrassegnati come percorsi multipli e vengono installati nel RIB come percorsi massimi. Il comando **show route** visualizza la parola chiave **BGP multi path** per le route installate come tali.

Per verificare il percorso contrassegnato come percorsi multipli, è possibile utilizzare il nuovo

comando per verificare l'ordine di ricezione di tutti i percorsi. I percorsi più recenti si trovano nella parte superiore dell'output.

Ad esempio, con la seguente configurazione:

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

Non vi sono modifiche nel processo decisionale relativo al miglior percorso, né vi sono attributi (come le preferenze locali) che influiscono sul processo decisionale relativo al miglior percorso.

Il record di risorse ha la seguente selezione di percorso 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

```

Perché il percorso da 10.0.0.1 è il migliore? Perché il percorso da 10.0.0.2 è il percorso di backup? Perché il percorso è da multipath 10.0.0.3? Perché il percorso dalla versione 10.0.0.4 è il backup (protezione multipath)? Perché il percorso da 10.0.0.5 non è il miglior percorso, non multipath e non il percorso di backup (protezione multipath)?

A tal fine, usare lo stesso comando **age-order**. I percorsi più recenti si trovano nella parte superiore dell'output.

```
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

```

È possibile usare i comandi show bgp con la parola chiave **bestpath-compare** per verificare perché un percorso non è il migliore (viene mostrato un motivo per percorso).

```
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

Poiché la maggior parte degli attributi nei percorsi BGP sono uguali tra i percorsi, la decisione di

scegliere il percorso migliore è passata all'ID router più basso del diffusore BGP. Ecco l'altoparlante BGP 10.0.0.1. Il percorso di backup è il secondo miglior percorso, da cui l'ID del router più basso dell'altoparlante BGP. Questa è la versione 10.0.0.2.

I percorsi da 10.0.0.4 e 10.0.0.5 non sono percorsi a percorsi multipli perché sono stati installati dopo i percorsi da 10.0.0.1, 10.0.0.2 e 10.0.0.3.

## Backup e backup (protezione multipath) Percorso

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

!
È configurato Maximum-path ibgp 3.

Il backup è il secondo miglior percorso. I percorsi multipath sono stati ricevuti prima del percorso di backup. Esistono tre percorsi a percorsi multipli e un altro è un percorso di backup.

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

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

```
Versions:
```

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

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

```
Last Modified: Sep 18 08:51:17.907 for 00:07:11
```

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

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

```
0.3
```

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

```
10.0.0.5
```

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

```
Flags: 0x2000000084020205, import: 0x96
```

```
Not advertised to any peer
```

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

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

```
Received Label 24013
```

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

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

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

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

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

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

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

```
10.0.0.5
```

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

```
10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2), if-handle 0x00000000
```

```
Received Label 24012
```

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

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

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

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

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

```
Flags: 0x2000000085070205, import: 0x9f
```

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

```
0.3
```



```

Advertised to peers (in unique update groups):
 10.0.0.5
Local, (Received from a RR-client)
 10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1), if-handle 0x00000000
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
  Received Path ID 0, Local Path ID 1, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #4: Received by speaker 0
Flags: 0x2000000084070205, import: 0x96
Advertised to peers (in unique update groups):
 10.0.0.6
Local, (Received from a RR-client)
 10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5), if-handle 0x00000000
  Received Label 24014
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
  Received Path ID 1, Local Path ID 3, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
Path #5: Received by speaker 0
Flags: 0x2000000084070205, import: 0x96
Advertised to peers (in unique update groups):
 10.0.0.5      10.0.0.6
Local, (Received from a RR-client)
 10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3), if-handle 0x00000000
  Received Label 24012
  Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
candidate, imported
  Received Path ID 0, Local Path ID 4, version 5
  Extended community: RT:65000:1
  Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1

```

Spegnere il router adiacente 10.0.0.5. A questo punto si avrà:

```
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

```

- Il percorso da 10.0.0.5 è scomparso.
- Il percorso da 10.0.0.2 è ancora di backup, ma ora è anche a percorsi multipli.
- Poiché il percorso di backup è anche un percorso a percorsi multipli, è ora disponibile un percorso di backup (protezione a percorsi multipli). Questo è il percorso da 10.0.0.4.

Sbloccare il router adiacente 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

```

I quattro percorsi installati in precedenza non sono stati modificati. È stato aggiunto solo il percorso da 10.0.0.5. Sta in cima perché è più recente. Non si tratta di un percorso multipath o di qualsiasi tipo di percorso di backup.

Il percorso da 10.0.0.5 è stato modificato da multipath a non multipath dopo una modifica dello stato nel percorso.

Conclusione :

- L'ordine in cui vengono ricevuti i percorsi svolge un ruolo importante nel determinare quali percorsi sono multipath.
- L'ordine in cui vengono ricevuti i percorsi svolge un ruolo se è presente o meno un percorso di backup (protezione multipath).
- L'ordine in cui vengono ricevuti i percorsi non svolge un ruolo in cui il percorso viene scelto come miglior percorso o percorso di backup.

## Ordina per metrica IGP

È possibile ordinare i percorsi multipath in base alla metrica IGP (Interior Gateway Protocol).

```
RP/0/RP0/CPU0:RR#conf t
RP/0/RP0/CPU0:RR(config)#router bgp 65000
RP/0/RP0/CPU0:RR(config-bgp)#vrf one
RP/0/RP0/CPU0:RR(config-bgp-vrf)#address-family ipv4 unicast
RP/0/RP0/CPU0:RR(config-bgp-vrf-af)#maximum-paths ibgp 3 unequal-cost ?
deterministic Deterministic Multipath selection primarily on IGP metric order
selective Allow multipaths only from marked neighbors
<cr>
RP/0/RP0/CPU0:RR(config-bgp-vrf-af)#maximum-paths ibgp 3 unequal-cost deterministic ?
selective Allow multipaths only from marked neighbors
<cr>
RP/0/RP0/CPU0:RR(config-bgp-vrf-af)#maximum-paths ibgp 3 unequal-cost deterministic
RP/0/RP0/CPU0:RR(config-bgp-vrf-af)#commit
RP/0/RP0/CPU0:RR(config-bgp-vrf-af)#end
RP/0/RP0/CPU0:RR#
```

Il costo disuguale è necessario, altrimenti si ottiene solo il miglior percorso, un percorso di backup, ma nessun percorso multipla perché il percorso multipla richiede lo stesso costo IGP per essere considerato percorso multiplo.

Il costo IGP da RR ai router PE viene modificato nella topologia. Il costo IGP è configurato come segue:

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

Esistono ancora:

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

Prima che la metrica IGP (il costo è lo stesso su tutti i collegamenti) cambi:

```
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

```

Dopo la modifica della metrica 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

- Il miglior percorso è ora il percorso da 10.0.0.5 a causa della metrica IGP inferiore (metrica 2).
- Il percorso di backup è ora il percorso con la metrica IGP di secondo livello, ovvero il percorso da 10.0.0.4 (metrica 3).
- Anche il miglior percorso e il miglior percorso di backup sono percorsi multipli, pertanto è necessario scegliere un percorso a percorsi multipli. Questo è il percorso da 10.0.0.3 (metrica 4).
- Il percorso di backup (protezione multipath) è il percorso da 10.0.0.2 (metrica 5).
- Infine, il percorso da 10.0.0.1 (metrica 6) non viene contrassegnato in quanto contiene la metrica peggiore.