IOS-XRでのBGPパス選択の設定と確認

内容

概要

このドキュメントでは、Cisco IOS® -XR内のボーダーゲートウェイプロトコル(BGP)のルートポリシーの**set path-selection**文を説明します。

背景説明

多くの設計では、1つのプレフィクスに対して複数のパスをBGPで選択してアドバタイズすることを目的としています。

デフォルトでは、1つのBGPパスだけがベストパスとして選択され、このベストパスだけがアドバタイズされます。BGPのベストパス選択アルゴリズムは、次を決定します。

[BGP でベスト パスを選択するアルゴリズム](#)

ベストパスの他に、バックアップパスとして2番目に最適なパスを選択できます。このバックアップパスは、BGP PIC(Prefix Independent Convergence)を使用した設計で使用できます。

BGPは、ロードバランシングを実現するために複数のパスをインストールできます。これは、等コストマルチパス(ECMP)ロードバランシングまたは不等コストマルチパス(UCMP)です。 これらのマルチパスは、ロードバランシングを実現するために、ルーティングテーブル(RIB)およびデータプレーンまたはFIB（転送インスタンスベース）テーブルにインストールされます。FIBテーブルは、CEF(Cisco Express Forwarding)テーブルとも呼ばれます。

この記事では、次の2つの目標に焦点を当てています。

- BGPでインストールする複数のパスを選択する方法は？
- 複数のパスをアドバタイズするためにBGPを取得する方法は？

BGPで使用されるもう1つの機能は、追加パス(ADD-Paths)です。 この機能により、BGPは1つのBGPセッションで複数のパスをアドバタイズできます。

要約

- ベストパスは常にBGPによって選択されます。そうでなければ、何か問題があります。この記事では、これらのシナリオについては説明しません。
- 特定の機能（BGP PICなど）が設定されている場合は、バックアップパスを選択できます。
- BGPの特定のアドレスファミリでルートポリシーを設定し、インストールまたはアドバタイズするパスを選択できます。
- Cisco IOS®-XR 7.3.1より前のバージョンでは、ルートポリシーで特定のプレフィクスのパスを選択するset path-selection文文が1つだけサポートされています。
- Cisco IOS®-XR 7.3.1から始めて、ルートポリシーで特定のプレフィクスのパスを選択する**複数の**set path-selection文文がサポートされています。
- Cisco IOS®-XR 7.3.1以降では、ルートポリシーを使用して1つのBGPネイバーにBGPプレフィックスの特定のパスをアドバタイズできる機能が追加されました。

BGPによるマルチパスの選択は、パスを受信する順序で行われます。ただし、**show bgpコマンド**は、辞書順にBGPパスを表示します。

Cisco IOS®-XR 7.3.1で導入された新しいコマンドを使用して、受信された順序でBGPパスを表示できます。

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

これは、マルチパスの検証とトラブルシューティングに役立ちます。パスがマルチパスとして選択され、別のパスとして選択されない理由についての主な質問が解決されます。

マルチパス保護パスは、マルチパスではなく、他のすべてのマルチパス・パスを保護するバックアップ・パスです。

Cisco IOS®-XR 7.3.1以降では、**set path-selection文**に新しいキーワード**multipath-protect-advertise**が追加されます。マルチパス保護パスをバックアップパスとともにアドバタイズする**か、またはマルチパスパスとともにアドバタイズできます**。route-policyで使用するコマンドは次のとおりです。

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

set path-selectionコマンドとそのキーワードの組み合わせ**の概要を**次のセクションで詳しく説明し、例を示します。

次のすべてのケースで、ベストパスがインストールされます。そうでない場合は、何らかの問題（ネクストホップが無効など）が発生しますが、これは**set path-selection**コマンドとは**関係あり**ません。

バックアップパスを選択するには、BGPバックアップパスを選択できる機能をBGPに対して有効にする必要があります。例：BGP PIC

マルチパスパスは、address familyコマンド**maximum-paths**によってBGPで有効に**なります。**

```
mamximum-paths {ebgp | eibgp | ibgp} <2-32> (unequal-cost)
```
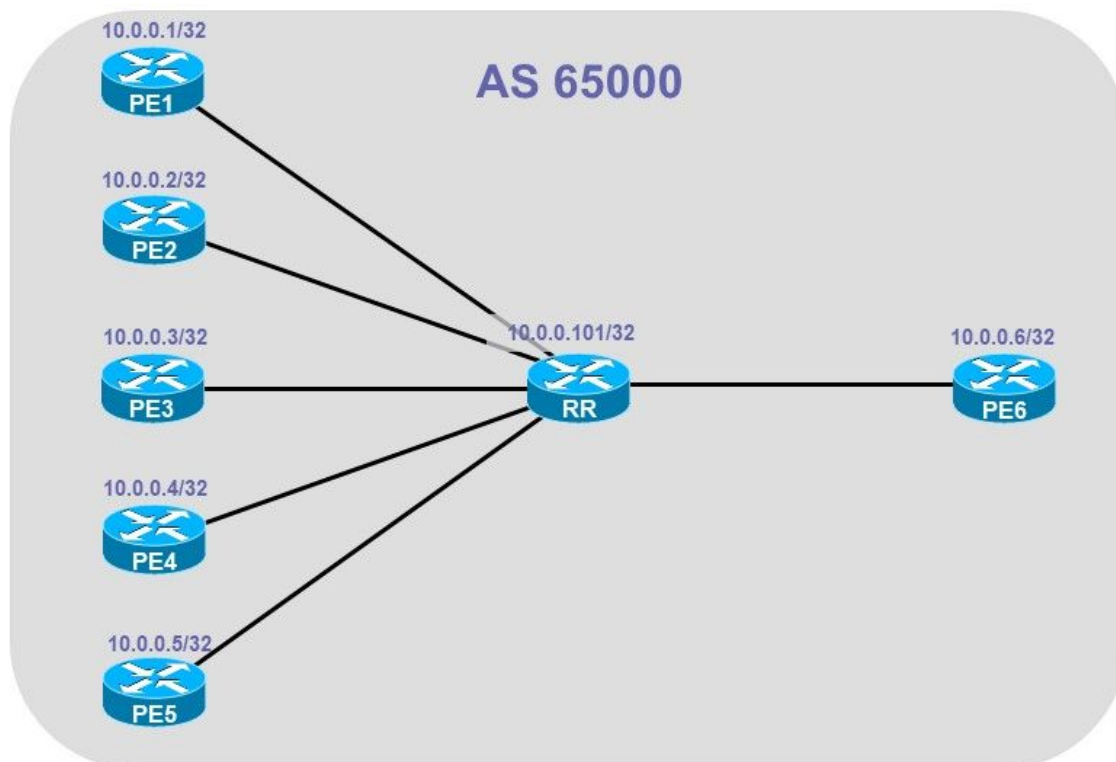定義上、ベストパスはマルチパスのパスです。ベストパスは、BGPのマルチパスが有効になっていない場合に、ルーティングテーブルにインストールされる唯一のパスです。コマンド**maximum-paths {ebgp | eibgp | ibgp} <2-32>（不等コスト）。**

次の表に、**set path-selection**コマンドを使用してすべてのオプションの概要を示します。詳細と例については、ここに示す各ケースの次のセクションを参照してください。

大文字と小文字を区別する	コマンド	インストール	ADVERTISE
1	set path-selection backup 1 install	1個のバックアップパスがインストールされました。	ベストパスだけがアドバイズされます。
0	set path-selection backup 1 advertise	バックアップパスがインストールされていません。	バックアップパスがアドバタイズされます。
3	set path-selection backup 1 advertise install	バックアップパスがインストールされます。	バックアップパスがアドバタイズされます。
4	set path-selection all advertise	バックアップパスがインストールされていません。マルチパス・パスがインストールされます。	すべてのパスがアドバタイズされます（ベストパス、バックアップパス、マルチパス、非マルチパス
5	set path-selection best-path	マルチパス・パスがインストールされます。	ベストパスだけがアドバイズされます。
6	set path-selection multipath advertise	マルチパス・パスがインストールされます。	マルチパス・パスがアドバタイズされます。
7	set path-selection backup 1 install multipath-protect	マルチパス・パスがインストールされます。別のパスがバックアップパス(マルチパスの横にパスが残っている場合は、「バックアップ（保護マルチパス）」パス)としてインストールされます。	ベストパスだけがアドバイズされます。

8	set path-selection backup 1 install multipath-protect advertise	マルチパス・パスがインストールされます。別のパスがバックアップパス(マルチパスの横にパスが残っている場合は、「バックアップ（保護マルチパス）」パス)としてインストールされます。	ベストパスとバックアップパスがアドバタイズさ...す。バックアップ（保護マルチパス）パスがアドバタ...されていません。
9 ミリ秒	set path-selection group-best advertise	Group-best selectionは、AS単位およびネクストホップ単位のベストパスです。マルチパス・パスがインストールされます。	すべてのグループベス...スがアドバタイズさ...。
10	set path-selection backup 1 install multipath-protect advertise multipath-protect-advertise	マルチパス・パスがインストールされます。別のパスがバックアップパス(マルチパスの横にパスが残っている場合は、「バックアップ（保護マルチパス）」パス)としてインストールされます。	ベストパス、バックア...パス、およびバックア...（保護マルチパス）...アドバタイズされま...
11	set path-selection multipath advertise multipath-protect	マルチパス・パスがインストールされます。	マルチパス・パスが...タイズされます。バックアップ（保護マ...パス）パスがアドバ...されていません。
12	set path-selection multipath advertise multipath-protect multipath-protect-advertise	マルチパス・パスがインストールされます。別のパスがバックアップパス(マルチパスの横にパスが残っている場合は、「バックアップ（保護マルチパス）」パス)としてインストールされます。	マルチパス・パスが...タイズされます。バックアップ（保護マ...パス）パスがアドバ...されます。

これは、このドキュメント全体で使用されているトポロジです。

いずれの場合も、RR（ルートリフレクタ）とPE6の間でADD-PATHが有効になっています。

PE1、PE2、PE3、PE4、PE5、およびPE6はすべて、RRへのvpnv4ユニキャストルートと同じプレフィクスをアドバタイズします。

PE6は入力PEで、RRからこのプレフィクスを受信します。

特に明記されていない限り、ADD-PATHはすべてのBGPセッションで有効になっており、maximum-paths ibgp 3はアドレスファミリvpnv4ユニキャスト用にRRで設定されています。

> **注**：RIBテーブルとCEFテーブルには、最大1つのバックアップパスがインストールされています。複数の機能が使用できないか、サポートされていません。パスは、BGPテーブル、RIBテーブル、およびCEFテーブルでバックアップとしてマークされます。

この記事では、バックアップルートは常にBGPによって選択されます。バックアップルートは別の機能によって選択できますが、ここでは常にBGPです。

マルチパスがBGPに設定されている場合、マルチパス（ECMPまたはUCMP）パスがBGPテーブルにインストールされている可能性があります。これらは**マルチパス**でマークされています。バックアップパスは2番目に最適なパスであるため、マルチパスが存在する場合は、マルチパスのパスの1つでなければなりません。これは、この機能が設定されている場合は、BGPによってバックアップ（保護マルチパス）が選択されている可能性があることを意味します(**set path-selection route-policy文の**multipath-protect**キーワード**)。 このような場合、このバックアップ(**protect multipath)パス**は、RIBおよびCEFテーブルのバックアップパスになります。BGPによって**選択さ**れ、BGPによってそのようにマークされたバックアップパスは、バックアップパスではなく、単なるマルチパスのパスです。

RRのバックアップルートは、そのRRがRRの役割しか持たない場合には、あまり意味がありません。

この記事では、RRがPEルータでもあることを前提としています。その場合、バックアップルートを選択してインストールすると意味があります。バックアップルートはBGP PICに使用できます。

バックアップルートは、特定のプレフィックスを指定する場合はRIB内でバックアップとマークされ、プレフィックスを指定しない場合は「!」とマークされます。

```
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
```

ルートポリシーでのパス選択コマンドの設定

このセクションでは、ルータBGPの下の特定のアドレスファミリに対するルートポリシーで使用されるset path-selection文について、すべて説明します。

これは、Cisco IOS®-XRバージョンがCisco IOS®-XR以前または後のバージョンであるかどうかに関係なく7.3.1ます。

設定：

```
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
 !
 !
!
```

set path-selection文を含むルートポリシーは、address-family vpnv4ユニキャストの下に適用されます。

set path-selection文を含むルートポリシーもVRFに適用されます。これは、バックアップルートをVRF RIB/CEFテーブルにインストールする必要がある場合 (またはPE-CEリンク上のBGPセッションを介してアドバタイズする必要がある場合) に必要です。

ここでは、両方のルートポリシーは同じですが、アドレスファミリとVRFの下で異なるルートポリシーを適用できます。

VRF oneの下で最大パスibgp 3が使用され、RIB/CEFテーブルに最大3つのECMPパスを指定できます。

これらのケースでは、**set path-selection**を使用したルートポリシーの可能性**がすべて示されています。**

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}
```

アドバタイズされたパスを確認します。

```
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
```

結論：VRFのRRに1つのバックアップパスがインストールされています。ベストパスだけがアドバタイズされます。

2.set path-selection backup 1 advertise

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

RP/0/RP0/CPU0:RR#show bgp vpnv4 unicast rd 1:1 10.1.1.1/32
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:
 Process           bRIB/RIB  SendTblVer
 Speaker                5           5
```

```
Last Modified: Sep 17 13:38:03.907 for 00:02:04
Paths: (5 available, best #1)
 Advertised to update-groups (with more than one peer):
   0.2 0.3
 Path #1: Received by speaker 0
 Advertised to update-groups (with more than one peer):
   0.2 0.3
 Local, (Received from a RR-client)
   10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
     Received Label 24012
     Origin incomplete, metric 0, localpref 100, valid, internal, **best**, group-best, **multipath**,
import-candidate, imported
     Received Path ID 0, Local Path ID 1, version 5
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
 Path #2: Received by speaker 0
 Advertised to update-groups (with more than one peer):
   0.3
 Local, (Received from a RR-client)
   10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
     Received Label 24012
     Origin incomplete, metric 0, localpref 100, valid, internal, **multipath**, **backup**, add-path,
import-candidate, imported
     Received Path ID 0, Local Path ID 2, version 5
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
 Path #3: Received by speaker 0
 Not advertised to any peer
 Local, (Received from a RR-client)
   10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
     Received Label 24012
     Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
     Received Path ID 0, Local Path ID 0, version 0
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
 Path #4: Received by speaker 0
 Not advertised to any peer
 Local, (Received from a RR-client)
   10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
     Received Label 24013
     Origin incomplete, metric 0, localpref 100, valid, internal, **multipath**, import-candidate,
imported
     Received Path ID 0, Local Path ID 0, version 0
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
 Path #5: Received by speaker 0
 Not advertised to any peer
 Local, (Received from a RR-client)
   10.0.0.5 (metric 2) from 10.0.0.5 (10.0.0.5)
     Received Label 24014
     Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
     Received Path ID 1, Local Path ID 0, version 0
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1


RP/0/RP0/CPU0:RR#**show route vrf one 10.1.1.1/32**
Routing entry for 10.1.1.1/32
 Known via "bgp 65000", distance 200, metric 0, type internal
 Installed Sep 17 13:38:04.233 for 00:04:26
 Routing Descriptor Blocks
   10.0.0.1, from 10.0.0.1, **BGP multi path**
     Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
     Route metric is 0
```

```
      10.0.0.2, from 10.0.0.2, BGP multi path
        Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
        Route metric is 0
      10.0.0.4, from 10.0.0.4, BGP multi path
        Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
        Route metric is 0
    No advertising protos.


RP/0/RP0/CPU0:RR#show cef vrf one 10.1.1.1/32
10.1.1.1/32, version 135, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08
(0xf696158)
 Updated Sep 17 13:38:04.236
 Prefix Len 32, traffic index 0, precedence n/a, priority 3
  via 10.0.0.1/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
   path-idx 0 NHID 0x0 [0xdab2bc0 0x0]
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
   next hop 10.0.0.1/32 via 24003/0/21
    next hop 10.1.101.1/32 Gi0/0/0/0    labels imposed {ImplNull 24012}
  via 10.0.0.2/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
   path-idx 1 NHID 0x0 [0xdab2e48 0x0]
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
   next hop 10.0.0.2/32 via 24001/0/21
    next hop 10.2.101.2/32 Gi0/0/0/4    labels imposed {ImplNull 24012}
  via 10.0.0.4/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
   path-idx 2 NHID 0x0 [0xdab2c98 0x0]
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
   next hop 10.0.0.4/32 via 24000/0/21
    next hop 10.4.101.4/32 Gi0/0/0/7    labels imposed {ImplNull 24013}
```
アドバタイズされたパスを確認します。


```
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
結論：バックアップルートがインストールされていません。バックアップパスがアドバタイズされます。

を選択します。set path-selection backup 1 advertise install

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

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

```
BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:
 Process           bRIB/RIB  SendTblVer
 Speaker                 5           5
Last Modified: Sep 17 14:20:36.907 for 00:01:55
Paths: (5 available, best #1)
 Advertised to update-groups (with more than one peer):
   0.2 0.3
 Path #1: Received by speaker 0
 Advertised to update-groups (with more than one peer):
   0.2 0.3
 Local, (Received from a RR-client)
   10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
     Received Label 24012
     Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
     Received Path ID 0, Local Path ID 1, version 5
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
 Path #2: Received by speaker 0
 Advertised to update-groups (with more than one peer):
   0.3
 Local, (Received from a RR-client)
   10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
     Received Label 24012
     Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
import-candidate, imported
     Received Path ID 0, Local Path ID 2, version 5
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
 Path #3: Received by speaker 0
 Not advertised to any peer
 Local, (Received from a RR-client)
   10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
     Received Label 24012
     Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
     Received Path ID 0, Local Path ID 0, version 0
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
 Path #4: Received by speaker 0
 Not advertised to any peer
 Local, (Received from a RR-client)
   10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
     Received Label 24013
     Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
     Received Path ID 0, Local Path ID 0, version 0
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

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


RP/0/RP0/CPU0:RR#show route vrf one 10.1.1.1/32
Routing entry for 10.1.1.1/32
 Known via "bgp 65000", distance 200, metric 0
 Number of pic paths 1 , type internal
 Installed Sep 17 14:23:42.997 for 00:00:59
 Routing Descriptor Blocks
   10.0.0.1, from 10.0.0.1, BGP multi path
      Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
      Route metric is 0
   10.0.0.2, from 10.0.0.2, BGP backup path
      Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
      Route metric is 0
   10.0.0.3, from 10.0.0.3, BGP multi path
      Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
      Route metric is 0
   10.0.0.5, from 10.0.0.5, BGP multi path
      Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
      Route metric is 0
 No advertising protos.


RP/0/RP0/CPU0:RR#show cef vrf one 10.1.1.1/32
10.1.1.1/32, version 185, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08
(0xf4e10a8)
 Updated Sep 17 14:23:42.999
 Prefix Len 32, traffic index 0, precedence n/a, priority 3
  via 10.0.0.1/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
   path-idx 0 NHID 0x0 [0xdab2bc0 0x0], Internal 0xd6a2730
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
   next hop 10.0.0.1/32 via 24003/0/21
    next hop 10.1.101.1/32 Gi0/0/0/0    labels imposed {ImplNull 24012}
  via 10.0.0.2/32, 2 dependencies, recursive, backup [flags 0x6100]
   path-idx 1 NHID 0x0 [0xdab2e48 0x0]
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
   next hop 10.0.0.2/32 via 24001/0/21
    next hop 10.2.101.2/32 Gi0/0/0/4    labels imposed {ImplNull 24012}
  via 10.0.0.3/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
   path-idx 2 NHID 0x0 [0xdab2060 0x0], Internal 0xd6a2550
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
   next hop 10.0.0.3/32 via 24007/0/21
    next hop 10.3.101.3/32 Gi0/0/0/6    labels imposed {ImplNull 24012}
  via 10.0.0.5/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
   path-idx 3 NHID 0x0 [0xdab2368 0x0], Internal 0xd6a2190
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
   next hop 10.0.0.5/32 via 24005/0/21
    next hop 10.5.101.5/32 Gi0/0/0/1    labels imposed {ImplNull 24014}
```
アドバタイズされたパスを確認します。

```
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
```

結論：バックアップルートがインストールされます。バックアップパスがアドバタイズされます
。1.と2.

4.set path-selection all advertise

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

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

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:
 Process            bRIB/RIB  SendTblVer
 Speaker                   5           5
Last Modified: Sep 17 14:28:58.907 for 00:04:04
Paths: (5 available, best #1)
 Advertised to update-groups (with more than one peer):
   0.2 0.3
 Path #1: Received by speaker 0
 Advertised to update-groups (with more than one peer):
   0.2 0.3
 Local, (Received from a RR-client)
   10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
     Received Label 24012
     Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
     Received Path ID 0, Local Path ID 1, version 5
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
```

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


RP/0/RP0/CPU0:RR#show route vrf one 10.1.1.1/32
Routing entry for 10.1.1.1/32
 Known via "bgp 65000", distance 200, metric 0, type internal
 Installed Sep 17 14:28:59.169 for 00:04:52
 Routing Descriptor Blocks
   10.0.0.1, from 10.0.0.1, BGP multi path
     Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
     Route metric is 0
   10.0.0.2, from 10.0.0.2, BGP multi path
     Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
     Route metric is 0
   10.0.0.5, from 10.0.0.5, BGP multi path
     Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
     Route metric is 0
 No advertising protos.


RP/0/RP0/CPU0:RR#show cef vrf one 10.1.1.1/32
10.1.1.1/32, version 201, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08
```

```
(0xf696158)
 Updated Sep 17 14:28:59.175
 Prefix Len 32, traffic index 0, precedence n/a, priority 3
  via 10.0.0.1/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
   path-idx 0 NHID 0x0 [0xdab2bc0 0x0]
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
   next hop 10.0.0.1/32 via 24003/0/21
    next hop 10.1.101.1/32 Gi0/0/0/0    labels imposed {ImplNull 24012}
  via 10.0.0.2/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
   path-idx 1 NHID 0x0 [0xdab2e48 0x0]
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
   next hop 10.0.0.2/32 via 24001/0/21
    next hop 10.2.101.2/32 Gi0/0/0/4    labels imposed {ImplNull 24012}
  via 10.0.0.5/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
   path-idx 2 NHID 0x0 [0xdab2368 0x0]
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
   next hop 10.0.0.5/32 via 24005/0/21
    next hop 10.5.101.5/32 Gi0/0/0/1    labels imposed {ImplNull 24014}
```
アドバタイズされたパスを確認します。


```
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
```

結論：バックアップルートがインストールされていません。すべての(5)パスがアドバタイズされます。

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}
```

結論：ベストパスとマルチパスのパスだけがインストールされます。ベストパスだけがアドバタイズされます。バックアップパスが選択されていないか、インストールされていないか、アドバタイズされていません。

6.set path-selection multipath advertise

Advertiseは必須キーワードです。

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

これを機能させるには、特定のアドレスファミリのBGPに対してマルチパスが有効になっている必要があります。

ここでは、VRF oneのipv4ユニキャストのマルチパスが有効になっています。

```
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}
```

アドバタイズされたパスを確認します。

```
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
```

- vpnv4パスにはマルチパスがマークされます。
- 3つのマルチパス経路がRIBにインストールされます。
- 3つのマルチパス・パスがアドバタイズされます。
- バックアップパスがありません。

結論：マルチパスパスはRIBにインストールされ、アドバタイズされます。バックアップが選択されていないか、インストールされていないか、アドバタイズされていません。

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}
```
アドバタイズされたパスを確認します。


```
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
```

バックアップ (パス保護) が存在**しない可能性があります**。たとえば、**BGP**最大パス2が設定されていて、パスが2つだけ受信されている場合は、2つのパスがマルチパスであり、バックアップ (保護マルチパス) パスは**ありません**。

結論：すべてのマルチパス経路がRIBにインストールされます。別のパスがバックアップ・パス (バックアップ (保護マルチパス) パス)として設置。 ベストパスだけがアドバタイズされます。

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

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

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

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:
 Process           bRIB/RIB  SendTblVer
 Speaker                  5           5
Last Modified: Sep 17 16:03:00.907 for 00:01:19
Paths: (5 available, best #1)
 Advertised to update-groups (with more than one peer):
   0.2 0.3
 Path #1: Received by speaker 0
 Advertised to update-groups (with more than one peer):
   0.2 0.3
 Local, (Received from a RR-client)
   10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
     Received Label 24012
     Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
     Received Path ID 0, Local Path ID 1, version 5
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
 Path #2: Received by speaker 0
 Advertised to update-groups (with more than one peer):
   0.3
 Local, (Received from a RR-client)
   10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
     Received Label 24012
     Origin incomplete, metric 0, localpref 100, valid, internal, multipath, backup, add-path,
import-candidate, imported
     Received Path ID 0, Local Path ID 2, version 5
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
 Path #3: Received by speaker 0
 Not advertised to any peer
 Local, (Received from a RR-client)
```

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


RP/0/RP0/CPU0:RR#show route vrf one 10.1.1.1/32
Routing entry for 10.1.1.1/32
  Known via "bgp 65000", distance 200, metric 0
  Number of pic paths 1 , type internal
  Installed Sep 17 16:03:01.199 for 00:05:13
  Routing Descriptor Blocks
      10.0.0.1, from 10.0.0.1, BGP multi path
        Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
        Route metric is 0
      10.0.0.2, from 10.0.0.2, BGP multi path
        Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
        Route metric is 0
      10.0.0.3, from 10.0.0.3, BGP multi path
        Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
        Route metric is 0
      10.0.0.4, from 10.0.0.4, BGP backup path
        Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
        Route metric is 0
  No advertising protos.


RP/0/RP0/CPU0:RR#show cef vrf one 10.1.1.1/32
10.1.1.1/32, version 281, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08
(0xf4e1108)
  Updated Sep 17 16:03:01.206
  Prefix Len 32, traffic index 0, precedence n/a, priority 3
    via 10.0.0.1/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
     path-idx 0 NHID 0x0 [0xdab2bc0 0x0], Internal 0xd6a2190
     recursion-via-/32
     next hop VRF - 'default', table - 0xe0000000
     next hop 10.0.0.1/32 via 24003/0/21
      next hop 10.1.101.1/32 Gi0/0/0/0    labels imposed {ImplNull 24012}
    via 10.0.0.2/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
     path-idx 1 NHID 0x0 [0xdab2e48 0x0], Internal 0xd6a2550
     recursion-via-/32
     next hop VRF - 'default', table - 0xe0000000
     next hop 10.0.0.2/32 via 24001/0/21
```

```
       next hop 10.2.101.2/32 Gi0/0/0/4    labels imposed {ImplNull 24012}
   via 10.0.0.3/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
    path-idx 2 NHID 0x0 [0xdab2060 0x0], Internal 0xd6a2910
    recursion-via-/32
    next hop VRF - 'default', table - 0xe0000000
    next hop 10.0.0.3/32 via 24007/0/21
      next hop 10.3.101.3/32 Gi0/0/0/6    labels imposed {ImplNull 24012}
   via 10.0.0.4/32, 2 dependencies, recursive, backup [flags 0x6100]
    path-idx 3 NHID 0x0 [0xdab2c98 0x0]
    recursion-via-/32
    next hop VRF - 'default', table - 0xe0000000
    next hop 10.0.0.4/32 via 24000/0/21
      next hop 10.4.101.4/32 Gi0/0/0/7    labels imposed {ImplNull 24013}
```

アドバタイズされたパスを確認します。


```
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
```

- マルチパスパスは3つあります。
- 「backup(protect multipath)」パスが1つあります。これは、RIB/CEFテーブルにインストールされているバックアップパスです。
- 5番目のパスはマークされません。
- ベストパスとバックアップパスがアドバタイズされます。

バックアップ (パス保護) が存在しない可能性があります。たとえば、**BGP最大パス2**が設定されていて、パスが2つのみ受信されている場合、パスは2つマルチパスで、バックアップ (保護マルチパス) パスはありません。

このアドバタイズされたバックアップパスは、マルチパスのパスの1つです (BGPテーブルでバックアップとマークされています) 。

これはmaximum-paths ibgp 1です。

```
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}
```

アドバタイズされたパスを確認します。

```
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
```
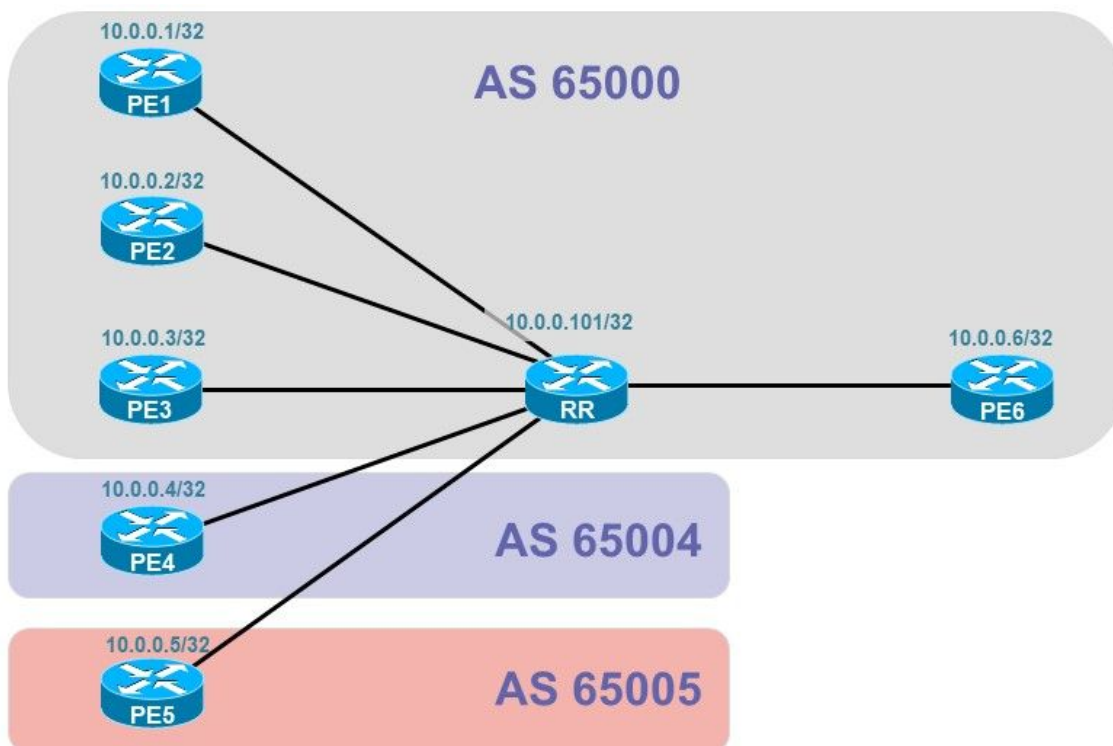
- RRにECMPはありません。
- 2番目に最適なパスはバックアップパスです。RIB/CEFテーブルにインストールされます。
- ベストパスとバックアップパスがアドバタイズされます。
- バックアップ(パス**パスの保護**)は**ありません**。

結論：すべてのマルチパス経路がRIBにインストールされます。別のパスがバックアップパスとしてインストールされます。ベストパスとバックアップパスがアドバタイズされます。

9.set path-selection group-best advertise

- Group-bestはadvertiseでのみ使用**できます**。
- Group-best selectionは、AS（自律システム）およびネクストホップごとのベストパスです。
- プレフィックスは、異なる自律システムから発信されます。

この場合は、別のトポロジが使用されます。ルータは図1と同じですが、PE4はAS 65004に存在し、PE5はAS 65005に存在します。他のすべてのルータはAS 65000に存在します。

画像 2

これは、RRとPE4の間、およびRRとPE5の間にeBGPセッションが存在することを意味します。

```
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}
```
RRには、RIBおよびCEFテーブルにインストールされた3つのECMPパスがあります。


```
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は、AS 65000から受信した3つのパスからグループベストパスをアドバタイズします。このパスに加えて、AS 65004から受信したグループベストパスとAS 65005から受信したグループベストパスもアドバタイズします。

3つのパスには異なるネイバーASがあるため、グループのベストパスが3つあります。これらのパスはすべてアドバタイズされます。マルチパス・パスはアドバタイズされません。

結論：すべてのグループベストパスがアドバタイズされます。

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

このオプションは、Cisco IOS®-XR 7.3.1以降でのみ使用できます。

Cisco IOS®-XR 7.3.1から開始するには、新しいキーワードmultipath-protect-advertiseがあります。

これにより、マルチパス**保護パスをバックアップ**パスとともに**アドバタイズできます**。Cisco IOS®-XR 7.3.1より前のバージョンでは、**multi-path-protectパスがインストールさ**れましたが、アドバタイズされませんでした。（ケース8を参照）。

```
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}
```
アドバタイズされたパスを確認します。


```
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
```

結論：すべてのマルチパス経路がRIBにインストールされます。別のパス(backup(protect multipath)path)は、バックアップパスとしてインストールされます。ベストパス、バックアップパス、およびバックアップ (保護マルチパス) パスがアドバタイズされます。

11. set path-selection multipath advertise multipath-protect

このオプションは、Cisco IOS®-XR 7.3.1以降でのみ使用できます。

```
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}
```

アドバタイズされたパスを確認します。

```
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
```

- 3番目のパスはバックアップパスです。BGPではbackup(protect multipath)としてマークされ、RIBではバックアップパスとしてインストールされます。
- ベストパスとマルチパスのパスがアドバタイズされます。

- 「backup(protect multipath)」パスはアドバタイズされません。

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

これにより、マルチパス保護パスをマルチパス・パスとともにインストールおよびアドバタイズできます。

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

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

BGP routing table entry for 10.1.1.1/32, Route Distinguisher: 1:1
Versions:
 Process             bRIB/RIB  SendTblVer
 Speaker                    5           5
Last Modified: Sep 18 06:22:22.907 for 00:03:12
Paths: (5 available, best #1)
 Advertised to update-groups (with more than one peer):
   0.2 0.3
 Path #1: Received by speaker 0
 Advertised to update-groups (with more than one peer):
   0.2 0.3
 Local, (Received from a RR-client)
   10.0.0.1 (metric 2) from 10.0.0.1 (10.0.0.1)
     Received Label 24012
     Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, multipath,
import-candidate, imported
     Received Path ID 0, Local Path ID 1, version 5
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
 Path #2: Received by speaker 0
 Advertised to update-groups (with more than one peer):
   0.2
 Local, (Received from a RR-client)
   10.0.0.2 (metric 2) from 10.0.0.2 (10.0.0.2)
     Received Label 24012
     Origin incomplete, metric 0, localpref 100, valid, internal, backup(protect multipath),
add-path, import-candidate, imported
     Received Path ID 0, Local Path ID 4, version 5
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
 Path #3: Received by speaker 0
 Not advertised to any peer
 Local, (Received from a RR-client)
   10.0.0.3 (metric 2) from 10.0.0.3 (10.0.0.3)
     Received Label 24012
     Origin incomplete, metric 0, localpref 100, valid, internal, import-candidate, imported
     Received Path ID 0, Local Path ID 0, version 0
     Extended community: RT:65000:1
     Source AFI: VPNv4 Unicast, Source VRF: one, Source Route Distinguisher: 1:1
 Path #4: Received by speaker 0
 Advertised to update-groups (with more than one peer):
   0.2
 Local, (Received from a RR-client)
   10.0.0.4 (metric 2) from 10.0.0.4 (10.0.0.4)
     Received Label 24013
     Origin incomplete, metric 0, localpref 100, valid, internal, multipath, add-path, import-
```

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


RP/0/RP0/CPU0:RR#show route vrf one 10.1.1.1/32
Routing entry for 10.1.1.1/32
 Known via "bgp 65000", distance 200, metric 0
 Number of pic paths 1 , type internal
 Installed Sep 18 06:22:23.059 for 00:03:34
 Routing Descriptor Blocks
   10.0.0.1, from 10.0.0.1, BGP multi path
     Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
     Route metric is 0
   10.0.0.2, from 10.0.0.2, BGP backup path
     Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
     Route metric is 0
   10.0.0.4, from 10.0.0.4, BGP multi path
     Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
     Route metric is 0
   10.0.0.5, from 10.0.0.5, BGP multi path
     Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000
     Route metric is 0
 No advertising protos.


RP/0/RP0/CPU0:RR#show cef vrf one 10.1.1.1/32
10.1.1.1/32, version 367, internal 0x5000001 0x30 (ptr 0xd96a770) [1], 0x0 (0xe3662a8), 0xa08
(0xf4e11c8)
 Updated Sep 18 06:22:23.062
 Prefix Len 32, traffic index 0, precedence n/a, priority 3
  via 10.0.0.1/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
   path-idx 0 NHID 0x0 [0xdab2bc0 0x0], Internal 0xd6a2190
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
   next hop 10.0.0.1/32 via 24003/0/21
    next hop 10.1.101.1/32 Gi0/0/0/0    labels imposed {ImplNull 24012}
  via 10.0.0.2/32, 2 dependencies, recursive, backup [flags 0x6100]
   path-idx 1 NHID 0x0 [0xdab2e48 0x0]
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
   next hop 10.0.0.2/32 via 24001/0/21
    next hop 10.2.101.2/32 Gi0/0/0/4    labels imposed {ImplNull 24012}
  via 10.0.0.4/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
   path-idx 2 NHID 0x0 [0xdab2c98 0x0], Internal 0xd6a2550
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
   next hop 10.0.0.4/32 via 24000/0/21
    next hop 10.4.101.4/32 Gi0/0/0/7    labels imposed {ImplNull 24013}
  via 10.0.0.5/32, 3 dependencies, recursive, bgp-multipath [flags 0x6080]
   path-idx 3 NHID 0x0 [0xdab2368 0x0], Internal 0xd6a2910
   recursion-via-/32
   next hop VRF - 'default', table - 0xe0000000
```

```
     next hop 10.0.0.5/32 via 24005/0/21
      next hop 10.5.101.5/32 Gi0/0/0/1    labels imposed {ImplNull 24014}
```
アドバタイズされたパスを確認します。

```
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
```
結論：

- 3つのパスはすべて、BGPでマルチパスとしてマークされます。
- 3 ECMPパスはRIB/CEFテーブルにインストールされます。
- 2番目のパスはバックアップパスです。BGPでbackup(protect multipath)としてマークされ、RIB/CEFテーブルにバックアップパスとしてインストールされます。
- ベストパスとマルチパスのパス、および「バックアップ（保護マルチパス）」パスがアドバ

タイズされます。

Cisco IOS®-XR 7.3.1における新しいパス選択動作

Cisco IOS®-XR 7.3.1では、次のように変更されています。

- ネイバーごとのパス選択が可能です。Cisco IOS®-XR 7.3.1より前のバージョンでは、これはアドレスファミリごとだけでした。
- 1つのルートポリシーで複数のset path-selectionステートメントを使用できます。
- BGPパスは、受信した順序で表示できます。

ネイバーパス単位の選択が可能

ルートポリシーで使用可能なパス選択を次に示します。

```
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
```
ベストパスがデフォルトです。

これは、アドレスファミリレベルでサポートされます。

設定例：

```
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
 !
 !
!
```

Cisco IOS®-XR 7.3.1から開始するには、ルートポリシーの一部のパス選択オプションもネイバーレベルでサポートされています。これにより、どのパスがどのBGPネイバーにアドバタイズされるかをより詳細に制御できるようになります。例として、BGPスピーカはベストパスと1つのバックアップパスを1つのBGPネイバーにアドバタイズしますが、マルチパスをアドバタイズして、別のネイバーに対するマルチパスのパスを保護します。

ネイバーレベルには、次の機能があります。

```
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
```

> **警告**：BGPコマンド**maximum**-pathが設定されている場合、ベストパス**はマルチパス**です。ただし、ルートポリシーで設定されている条件が**is-multi-pathの場合**は、最適パスではないマルチパスのパスのみがアドバタイズされます。これはBGPの設計によって異なりますが、マルチパスのパスをアドバタイズする必要がある場合は、ベストパスもアドバタイズする必要があります。

is-allとis-multipath-protectは、Cisco IOS®-XR 7.3.1で新たに導入されました。

1つのルートポリシーで複数のset path-selectionステートメントが許可される

Cisco IOS®-XR 7.3.1では、1つのプレフィクスに関連する1つのルートポリシーに複数のパス選択ステートメントを設定できます。Cisco IOS®-XR 7.3.1より前は、これは許可されておらず、BGPパスの動作が予測不能になっていました。

複数のパスを選択しているかどうかは、プレフィックスごとに確認されます。

たとえば、Cisco IOS®-XR 7.3.1より前のバージョンでは、次はサポートされていません。

```
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
```
同じプレフィクスに**適用される**ルートポリシーには、2つのset path-selection文があります。

ただし、**Cisco IOS®-XR 7.3.1より前のバージョン**では、以下がサポートされています。理由は、異なるパス選択ステートメントが異なるプレフィックスに対して使用されているためです。これは、選択文（宛先、コミュニティ、...）が使用されているためです。

例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
```
これは、set-path selection文が異なるプレフィクスに関連する（2つの異なるif文に含まれる）場合と同じようです。

例 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
```
これは、set path selection文が異なるプレフィクスに関連する場合に適しています(これらはif文の2つの異なる部分にあります)。

Cisco IOS®-XR 7.3.1以降でサポートされています。

複数のset path-selection文文を持つルートポリシーの例を次に示します。

```
route-policy BGP-Path-Selection
 set path-selection multipath advertise
 set path-selection backup 1 install multipath-protect advertise multipath-protect-advertise
end-policy
!
```
neighbor route-policyは、そのネイバーにアドバタイズされるパスを指定します。すべてのパスは、アドレスファミリレベルでマーク済みのパスからのみ選択できます。

アドレスファミリレベルで、パスを選択できます。

```
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
```
ネイバーレベルには、次の機能があります。

```
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
```

> **警告**：BGPコマンド**maximum**-pathが設定されている場合、ベストパスは**マルチパス**です。ただし、ルートポリシーで設定されている条件が**is-multi-path**の**場合**は、最適パスではないマルチパスのパスのみがアドバタイズされます。これはBGPの設計によって異なりますが、マルチパスのパスをアドバタイズする必要がある場合は、ベストパスもアドバタイズする必要があります。

is-allと**is-multipath-protect**は、Cisco IOS®-XR 7.3.1で新たに導入されました。

このアプローチでは、パス選択のマーキングには、**使用しているパス選択モードの組み合わせが考えられます (バックアップ、マルチパス、マルチパス保護など) 。**

ネイバーポリシーは、パス選択マーキングに基づいてアドバタイズメントを制御します。

マーキングパーツの場合：たとえば、アドレスファミリレベルのルートポリシーで、バックアップとマルチパスを一緒に設定できます。

```
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
!
```
上記の2つの**set path-selection**文は、Cisco IOS®-XR 7.3.1以降で新しくサポートされています。この例でも**maximum-path ibgp 3**が設定されています。次の文があります。

- ベストパスとすべてのマルチパスのパスをアドバタイズできます。
- ベストパスとバックアップ (保護マルチパス) パスをアドバタイズできます。

この組み合わせは、Cisco IOS®-XR 7.3.1より前では不可能でした。つまり、(1)または(2)のいずれかが有効になります。

次に結果を示します。

```
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}
```
アドバタイズされたパスを確認します。

```
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
```

is-best-pathまたはis-backup-pathに基づいて、プライマリ (ベストパス) パスとバックアップパスを1つのネイバーにアドバタイズできるようになりました。

別のネイバーの場合、マルチパスはis-multi-pathでアドバタイズできます。

neighbor route-policyの例 (アドレスファミリレベルでroute-policyとともに使用) :

```
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
!
```

RRに次のBGPパスがある場合 :

```
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
```

次に、ネイバールートポリシーの最初のパスを示します。これは次のとおりです。

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

ネイバーPE6は次のパスを受信します。

```
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
```
これらの2つのパスは、RRのベストパスとバックアップパスです。

neighbor route-policyの2番目の部分では、次のようになります。

```
   if destination is-multi-path or destination is-multipath-protect
   then
     pass
```
ネイバーPE6は次のパスを受信します。

```
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
```

これらのパスは、マルチパスのパス(ベストパスを含まない)とバックアップ (マルチパスを保護) のパスです。

BGPパスを受信順に表示する

BGPパスは辞書順に示されています。

Cisco IOS®-XR 7.3.1で導入された新しいコマンドを使用して、受信された順序でBGPパスを表示できます。

```
show bgp <afi> rd <rd> <path_details> <age-order>
```
このコマンドは、パスがマルチパスとしてマークされた理由を確認するのに役立ちます。先に受信したパスはマルチパスとマークされ、最大パスルートとしてRIBにインストールされます。**show route**コマンドは、そのようにインストールされたルートのBGPマルチパスキーワードを表示します。

マルチパスとマークされているパスを確認するには、新しいコマンドを使用して、すべてのパスが受信された順序を確認できます。新しいパスが出力の先頭にあります。

たとえば、次の設定を使用します。

```
route-policy BGP-Path-Selection
  set path-selection multipath advertise
  set path-selection backup 1 install multipath-protect advertise multipath-protect-advertise
end-policy
!
```
ベストパスの決定プロセスには変更はなく、パスにベストパスの決定プロセスに影響を与える属性 (ローカルプリファレンスなど) もありません。

RRには次のBGPパスが選択されています。

```
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
```

10.0.0.1からのパスがベストパスである理由10.0.0.2からのパスがバックアップパスである理由10.0.0.3マルチパスからのパスはなぜですか。10.0.0.4からのパスがバックアップ (保護マルチパス) であるのはなぜですか。10.0.0.5からのパスが最適パスではなく、マルチパスではなく、バックアップ (保護マルチパス) パスでないのはなぜですか。

これは、同じコマンドを最後にage-orderで表示できます。新しいパスが出力の先頭にあります。

```
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
```

show bgpコマンドとキーワードbestpath-compareを使用すると、パスがベストパスではない理由
を確認できます（パスごとに理由が表示されます）。

```
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
```

BGPパスのほとんどのアトリビュートはパス間で同じであるため、最適パスの選択はBGPスピーカの最も低いルータIDに下がりました。BGPスピーカ10.0.0.1を次に示します。バックアップパスは2番目に最適なパスです。したがって、BGPスピーカの2番目に低いルータIDになります。これは10.0.0.2です。

10.0.0.4および10.0.0.5からのパスは、10.0.0.1、10.0.0.2、および10.0.0.3からのパスよりも後にインストールされるため、マルチパスのパスではありません。

バックアップ対バックアップ (マルチパス保護) パス

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

Maximum-path ibgp 3が設定されている。

バックアップは2番目に最適なパスです。ここでは、マルチパスのパスがバックアップパスの前に受信されました。したがって、3つのマルチパスが存在し、もう1つはバックアップパスです。

```
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
```

ネイバー10.0.0.5をシャットダウンします。次のコマンドが表示されます。

```
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
```

- 10.0.0.5からのパスが消えました。
- 10.0.0.2からのパスは引き続きバックアップされていますが、マルチパスにもなっています。
- バックアップパスもマルチパスのパスであるため、バックアップ (マルチパスを保護) パス
  が作成されます。これは10.0.0.4からのパスです。

ネイバー10.0.0.5のシャットダウンを解除します。

```
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
```

以前にインストールされた4つのパスに変更はありません。10.0.0.5からのパスだけが追加されました。新しいため、一番上に表示されます。マルチパスやバックアップパスではありません。

パスの状態が変化した後、10.0.0.5からのパスがマルチパスから非マルチパスに変更されました。

結論：

- パスが受信される順序は、マルチパスであるパスを決定する際に役立ちます。
- パスを受信する順序は、バックアップ（マルチパスを保護）パスが存在するかどうかによって役割を果たします。
- パスが受信される順序は、パスがベストパスまたはバックアップパスとして選択される役割を果たしません。

IGPメトリックによる順序

Interior Gateway Protocol(IGP)メトリックごとにマルチパスのパスを順序付けるオプションがあります。

```
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#
```

不等コストが必要な場合は、最適パスであるバックアップパスのみが必要ですが、マルチパスではマルチパスと見なすために同じIGPコストが必要になるため、マルチパスは必要ありません。

トポロジでは、RRからPEルータへのIGPコストが変更されます。IGPコストは次のように設定されます。

- RRからPE1:5
- RRからPE2:4
- RRからPE3:3
- RRからPE4:0
- RRからPE5:1

次の情報が残っています。

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

IGPメトリック（すべてのリンクでコストが同じ）が変更される前：

```
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
```

IGPメトリックの変更後：

```
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: 0x200000085070205, 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
```

- IGPメトリック（メトリック2）が低いため、ベストパスは10.0.0.5からのパスになります。
- これで、バックアップパスは、2番目に最適なIGPメトリック(10.0.0.4（メトリック3）からのパス)を持つパスになります。
- ベストパスとバックアップパスもマルチパスであるため、1つのマルチパスパスを選択する必要があります。これは10.0.0.3（メトリック4）からのパスです。
- バックアップ（保護マルチパス）パスは、10.0.0.2（メトリック5）からのパスです。
- 最後に、10.0.0.1（メトリック6）からのパスは最悪のメトリックであるため、まったくマークされません。