

Implementing DCI Layer 3 Gateway between MPLS-VPN and EVPN Data Center

This chapter module provides conceptual and configuration information for Data Center Interconnect (DCI) Layer 3 Gateway between MPLS-VPN and EVPN Data Center.

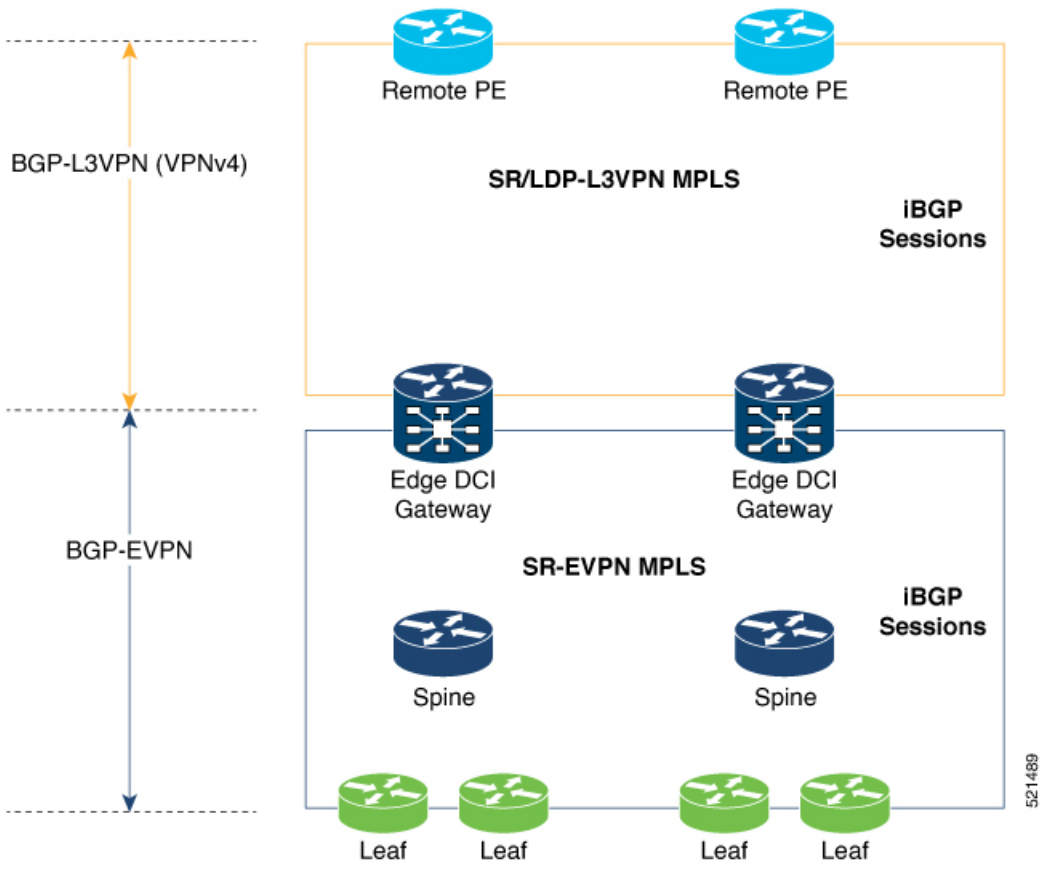
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Data Center Interconnect between MPLS-VPN and EVPN-MPLS

This part provides conceptual and configuration information for Data Center Interconnect (DCI) Layer 3 Gateway with EVPN-MPLS on Cisco NCS 5500 Series Router.

DCI Layer 3 Gateway with EVPN-MPLS

You can use SR-EVPN for Data Center on routers for a spine-leaf architecture with edge devices such as border leaf. DCI L3 stitching allows Data Centers that run SR-EVPN to communicate with legacy and existing MPLS VPN (VPNv4) sites.



In this topology,

Leaf (ToR) – Router acts as both access switch and distributed PE. Leaf establishes BGP EVPN neighborship with Spine route-reflector (RR). This router sends and receives prefixes from the DCI Gateway. Leaf ToR provides the following types of services:

- Regular L3 VRF configuration using subinterfaces to attach some CE devices. Traditional PE-CE scenario without EVPN configuration.
- L3 EVPN VRF using L2VPN configuration to attach multiple Data Centers services.

Leaf sends and receives prefixes from or to the DCI gateway:

- Leaf sends prefixes to DCI: Leaf re-originates local learned VRF subnet route as EVPN Route Type 5 with the EVPN RT (stitching-rt or regular RT), then sends to Spine RR. Spine RR sends prefixes to DCI gateway.
- Leaf receives prefixes from DCI: Leaf receives EVPN Route Type 5 from Spine RR that is re-originated at DCI gateway due to stitching between VPNv4 and EVPN. Leaf imports remote VPNv4 prefixes to local VRF matching VPNv4 RT (stitching-rt or regular RT).

Spine RR: Spine RR establishes BGP EVPN neighborship with Leaf (ToR) and Edge DCI Gateway serving as Route-Reflector for EVPN prefixes between the devices in the Data Center. Leaf and DCI Gateway must be configured as clients of Spine RR.

Edge (DCI gateway): Edge (DCI gateway) acts as an edge router that allows communication between services connected at Leaf and CEs in legacy MPLS network architecture. The edge DCI gateway establishes BGP EVPN neighborship with Spine RR and remote PEs, or RR depending on legacy MPLS network architecture.

The edge DCI gateway sends and receives prefixes from or to the Data Center:

- DCI gateway receives prefixes from legacy MPLS VPNv4 network and sends prefixes to Leaf: DCI gateway receives L3VPN (VPNv4) routes from remote MPLS VPN (VPNv4) PE or RR depending on legacy MPLS network architecture matching the VPNv4 RT (stitching-rt or regular RT). Then re-originate these prefixes as EVPN Route Type 5 with the EVPN RT (stitching-rt or regular RT) advertising to Spine RR due to BGP EVPN neighbor with the Spine.
- DCI gateway receives prefixes from Leaf and sends prefixes to legacy MPLS VPNv4 network: DCI gateway receives EVPN Route Type 5 originated from Leaf (ToR) by Spine RR due to BGP EVPN neighbor with the Spine. Leaf and DCI gateway does not have a direct BGP neighborship. Then import the routes to local VRF matching the EVPN RT (stitching-rt or regular RT) and re-originate this prefix as VPNv4 router with the VPNv4 RT (stitching-rt or regular RT) and advertise to remote MPLS VPN (VPNv4) PE or RR depending on legacy MPLS network architecture.

Remote PE: Remote PE receives traditional MPLS L3VPN prefixes (VPNv4) by DCI Gateway or RR depending on legacy MPLS network architecture. You must have a unique Route-Distinguisher (RD) between remote PEs and DCI gateway to allow stitching re-originate prefixes from VPNv4 to EVPN at DCI Gateway.

Stitching RTs and Regular RTs can be assigned to any side, EVPN or VPNv4, irrespective of the address-family. Consider the following supported scenarios:

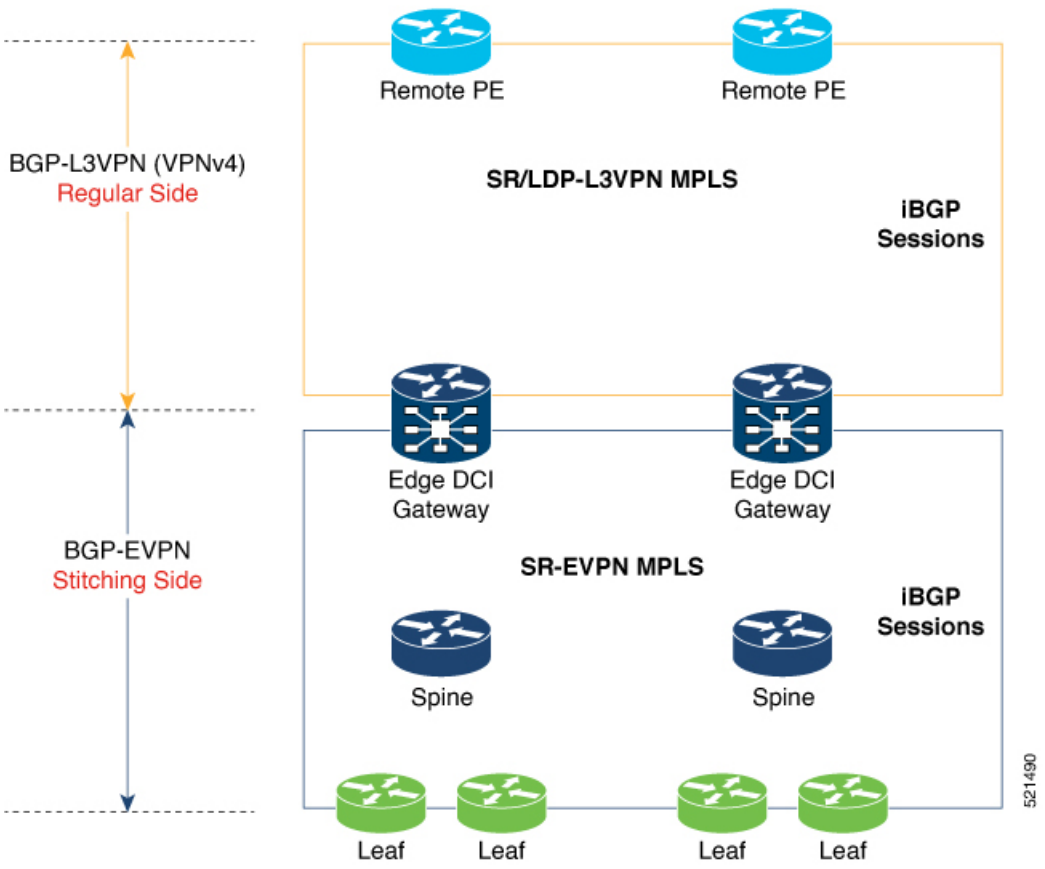
VPNv4-Regular RT and EVPN-Stitching RT

For each VRF on the DCI gateway, there are two sets of manually configured import and export route-targets for VPNv4 as a regular side and EVPN as a stitching side. Consider the following sets:

- Data Center Route-Targets for EVPN associated with EVPN BGP neighbor (Stitching RT).
- MPLS L3VPN Route-Targets for VPNv4 or VPNv6 associated with L3VPN BGP neighbor (Regular RT).

This separation of RTs enables the two sets of RTs to be independently configured. The RTs associated with the EVPN BGP neighbor require **stitching-rt** keyword under VRF configuration. The route-types associated with the L3VPN BGP neighbor do not require the keyword.

The following topology shows regular/normal and stitching side.



Route Targets

The RTs associated with the EVPN BGP neighbor are labelled as stitching RTs. The RTs associated with the L3VPN BGP neighbor are normal RTs.

Route Re-Origination

Consider control plane information propagation by the edge DCI gateway from the L3VPN (regular/normal side) to the Data Center (stitching side). Edge DCI gateway advertises to its BGP EVPN neighbor the routes that are re-originated after importing them from the L3VPN BGP neighbor. For this case of VPNv4 or VPNv6 routes being propagated to the BGP EVPN neighbors (Data Center neighbors), re-originating the routes refers to replacing the normal route-targets with the local route-target values (stitching-rt) associated with the BGP EVPN neighbors.

Route Address-Family and Encoded Address-Family

When an address-family is configured for a BGP neighbor, it means that the specified address-family routes encoded with the NLRI for that address-family are advertised to the neighbor. This does not hold for Data Center BGP neighbors because they use only EVPN address-family. Here, BGP neighbors advertise VPNv4 or VPNv6 unicast routes using the EVPN NLRI encoding. Thus, the encoded address-family and route address family can be possibly different. You can advertise the VPNv4 or VPNv6 address-family using the **advertise vpnv4 unicast** or **advertise vpnv6 unicast** command. For example, an EVPN address-family BGP neighbor configured with the **advertise vpnv4 unicast** command sends VPNv4 unicast routes in an EVPN encoded NLRI.

Local VPNv4 or VPNv6 Route Advertisement

On the edge DCI gateway, the locally sourced VPNv4 or VPNv6 routes (any CE directly connected not using L2VPN with BD/EVI/BVI, using only regular L3 VRF) can be advertised to the BGP EVPN neighbors with the normal route targets (RTs) configured for the VRF or the stitching RTs associated with the BGP EVPN neighbors. By default, these routes are advertised with the normal route targets. You can configure this local VPNv4 or VPNv6 route advertisements to be advertised with stitching RTs to the BGP EVPN neighbors by using the **advertise vpnv4 unicast local stitching-rt** or **advertise vpnv6 unicast local stitching-rt** command as required.

VPNv4 neighbors do not require any additional configuration. By default, these routes are advertised with the normal route-targets to BGP L3VPN neighbors.

Route Distinguishers

The Router Distinguisher (RD) associated per VRF must be unique per PE in the network. There are few available options to keep unique RD per device:

- Manual configuration: You must manually assign a unique value per device in the network. For example, in this scenario:
  - Leaf (ToR) = RD 1
  - Edge DCI Gateway = RD 2
  - Remote PE = RD 3
- Use **rd auto** command under VRF. To assign a unique route distinguisher for each router, you must ensure that each router has a unique BGP router-id. If so, the **rd auto** command assigns a Type 1 route distinguisher to the VRF using the following format: *ip-address:number*. The IP address is specified by the BGP router-id statement and the number (which is derived as an unused index in the 0 to 65535 range) is unique across the VRFs.



Note In a DCI deployment, for route re-originate with stitching-rt for a particular VRF, using the same Route Distinguisher (RD) between edge DCI gateway and MPLS-VPN PE or same RD between edge DCI gateway and Leaf (ToR) is not supported.

Configure VPNv4-Regular RT and EVPN-Stitching RT

This section describes tasks to configure VPNv4-Regular RT and EVPN-Stitching RT. Perform the following tasks to complete the configuration:

- Configure Leaf (ToR)
- Configure Spine-RR (Route Reflector)
- Configure Edge DCI Gateway
- Configure EVPN BGP neighbor and route advertisements
- Configure L3VPN BGP neighbor relationship and route advertisements

Configure Leaf (ToR)

Configure VRF in Leaf (ToR) at BGP-EVPN (Stitching Side) with Stitching-RT.

```
vrf data-center1
 address-family ipv4 unicast
  import route-target
   1:2 stitching                              // BGP - EVPN (Stitching Side)
!
  export route-target
   1:2 stitching                             // BGP - EVPN (Stitching Side)
  !
router bgp 100
  neighbor 10.10.1.1                        // Spine Loopback IP Address
    address-family l2vpn evpn
       advertise vpnv4 unicast
       advertise vpnv6 unicast
  !
```



Note Advertise vpnv4/vpnv6 unicast enables local learned regular L3 VRF prefixes to be advertised as EVPN prefixes to BGP – EVPN neighbor. This means any local prefixes such as PE-CE without L2VPN with BD/EVI/BVI configuration. If all the services are pure EVPN with L2VPN with BD/EVI/BVI configuration these commands are not required.

Configure Spine-RR

Configure Spine RR with Leaf (ToR) and edge DCI gateway as RR client for AFI L2VPN EVPN. VRF configuration is not required.

```
// VRF Config is not required //

router bgp 100
  neighbor 10.10.2.1                 // Leaf (ToR) Loopback IP Address
    address-family l2vpn evpn
       route-reflector-client
   !
  neighbor 10.10.3.1                // Edge DCI Gateway  Loopback IP Address
    address-family l2vpn evpn
       route-reflector-client
!
```

Configure Edge DCI Gateway

You can configure DCI with the same VRF as Leaf (ToR). Use the same RT as remote PE for L3VPN network or the same VRF if that is possible.

Configure VRF and Route Targets Import and Export rules

Perform the following steps to configure VRF and define route targets to be used for import and export of forwarding information.

```
vrf data-center1
 address-family ipv4 unicast
  import route-target
   1:1                              // BGP – L3VPN (Regular/normal Side)
```

```
   1:2 stitching                    // BGP - EVPN (Stitching Side)
!
  export route-target
   1:1                             // BGP - L3VPN (Regular/normal Side)
   1:2 stitching                   // BGP - EVPN (Stitching Side)
!
```

Configure EVPN BGP Neighbor and Route Advertisements

Perform this task on the edge DCI gateway to configure BGP neighbor relationship and route advertisements with the EVPN BGP neighbor.

```
router bgp 100
 addreess-family l2vpn evpn
!
 neighbor 10.10.1.1               // Spine Loopback IP Address
  address-family l2vpn evpn
   import stitching-rt re-originate  //Imp EVPN 1:2, reoriginate VPNv4 RT 1:1
   advertise vpnv4 unicast re-originated stitching-rt //Send routes EVPN 1:2
   advertise vpnv6 unicast re-originated stitching-rt //Send routes EVPN 1:2
!
```

Configure L3VPN BGP Neighbor Relationship and Route Advertisements

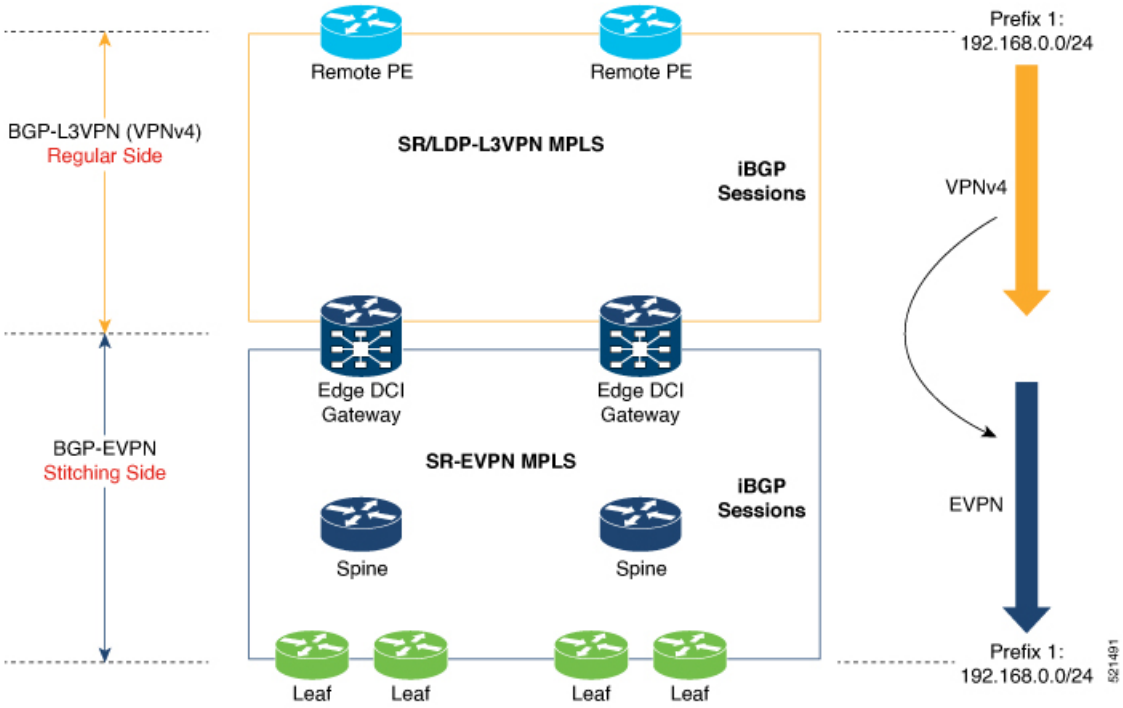
Perform the following steps to configure BGP neighbor relationship and route advertisements with the L3VPN BGP neighbor.

```
router bgp 100
 address-family vpnv4 unicast
!
 neighbor 10.10.1.1               // Spine Loopback IP Address
  address-family vpnv4 unicast      // Same config for VPNv6
   import re-originate stitching-rt // Imp VPNv4 1:1, re-originate EVPN 1:2
   advertise vpnv4 unicast re-originated   // Send routes VPNv4 RT 1:1
!
```

Configuration applies in two directions:

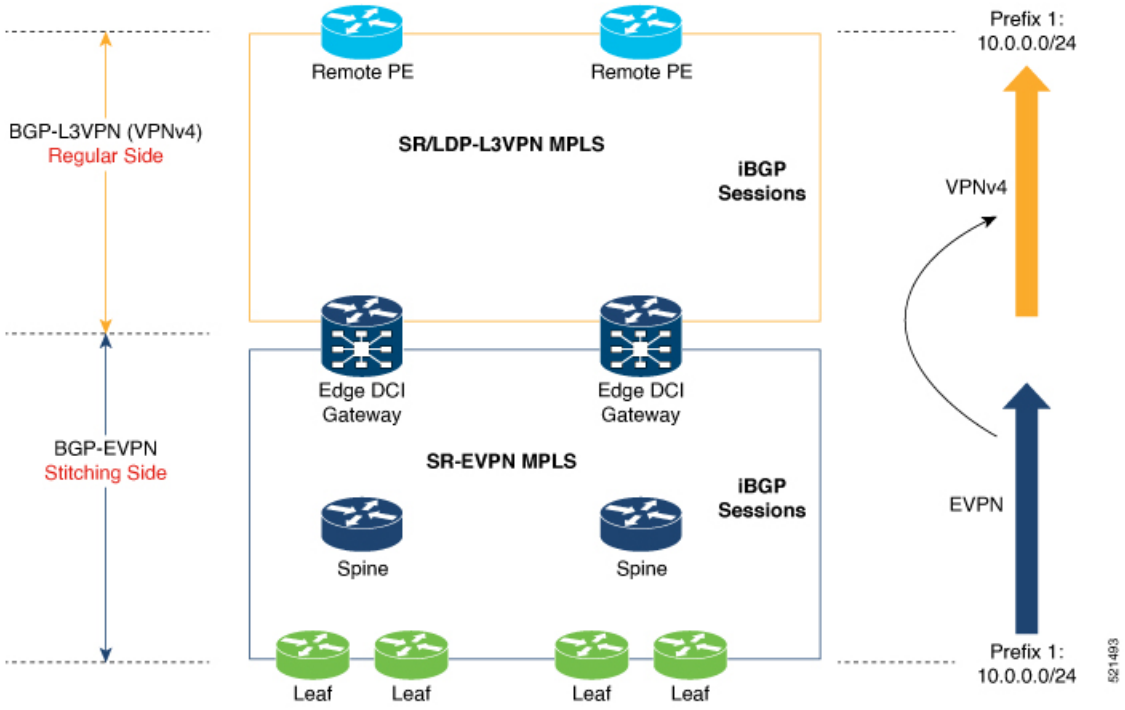
- Stitching from VPNv4 to EVPN routes. Prefixes received from MPLS L3VPN network and re-originated as EVPN prefixes towards Data Center Spine RR and Leaf (ToR).

1. Importing VPNv4 routes with import **re-originate stitching-rt** command under AFI VPNv4 UNICAST. This command imports routes using RT 1:1 and then reoriginate with BGP EVPN 1:2 **stitching-rt**.
2. Advertising re-originated EVPN routes with VPNv4 RT with advertise **vpvn4 unicast re-originated** command under AFI L2VPN EVPN. This command advertises routes from MPLS L3VPN network (VPNv4) to BGP EVPN neighbors inside Data Center (Spine RR and then Leaf (ToR)), re-originating these routes using BGP EVPN 1:2 **stitching-rt**.



- Stitching from EVPN to VPNv4 routes. Prefixes received from BGP-EVPN Data Center and re-originated as MPLS L3VPN prefixes towards VPNv4 RR or remote PE in L3VPN network.

1. Importing EVPN routes with import **stitching-rt re-originate** command under AFI L2VPN EVPN. This command imports routes using RT 1:2 **stitching-rt** and then re-originate with VPNv4 regular/normal VPNv4 RT 1:1.
2. Advertising re-originated EVPN routes with VPNv4 RT with **advertise vpvn4 unicast re-originated** command under AFI VPNv4 UNICAST. This command advertises routes from EVPN Data Center to VPNv4 RR or remote PEs, re-originating these routes using regular/normal VPNv4 RT 1:1.



Verification of Edge DCI Gateway Configuration

```
Router# show bgp l2vpn evpn

Fri Aug 21 00:24:10.773 PDT
BGP router identifier 30.30.30.30, local AS number 100
BGP generic scan interval 60 secs
Non-stop routing is enabled
BGP table state: Active
Table ID: 0x0   RD version: 0
BGP main routing table version 16
BGP NSR Initial initsync version 1 (Reached)
BGP NSR/ISSU Sync-Group versions 16/0
BGP scan interval 60 secs

Status codes: s suppressed, d damped, h history, * valid, > best
     i - internal, r RIB-failure, S stale, N Nexthop-discard
Origin codes: i - IGP, e - EGP, ? - incomplete
   Network            Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 100:1
*>i[2][10000][48][0226.51bd.c81c][32][200::1001]/232
     11.0.0.1                      100      0 i
*>i[2][10000][48][0226.51bd.c81c][32][200:1::1001]/232
     11.0.0.1                      100      0 i
*>i[2][10000][48][0226.51bd.c81c][32][200.1.1.1]/136
        11.0.0.1                      100      0 i
*>i[2][10000][48][0226.51bd.c81c][32][200.1.1.2]/136
     11.0.0.1                      100      0 i
*>i[5][4231][32][100.1.1.1]/80
     11.0.0.1                      100      0 i
*>i[5][4231][32][100.1.1.2]/80
     11.0.0.1                      100      0 i
*>i[5][4231][112][fec0::1001]/176
     11.0.0.1                      100      0 i
```

```
*>i[5][4232][112][fec0::1:1001]/176
     11.0.0.1                 100      0 i

Processed 8 prefixes, 8 paths
```

```
Router# show bgp l2vpn evpn rd 100:1 [5][4231][112][fec0::1001]/176 detail

Fri Aug 21 00:34:43.747 PDT
BGP routing table entry for [5][4231][112][fec0::1001]/176, Route Distinguisher: 100:1
Versions:
  Process           bRIB/RIB  SendTblVer
  Speaker                 5           5
    Flags: 0x04040001+0x00000000;
Last Modified: Aug 21 00:16:58.000 for 00:17:46
Paths: (1 available, best #1)
  Not advertised to any peer
  Path #1: Received by speaker 0
  Flags: 0x4000600025060005, import: 0x3f
  Not advertised to any peer
  Local
    11.0.0.1 (metric 2) from 20.0.0.1 (11.0.0.1)
      Received Label 16001
      Origin IGP, localpref 100, valid, internal, best, group-best, import-candidate,
reoriginate, not-in-vrf
      Received Path ID 0, Local Path ID 1, version 5
      Extended community: Flags 0x6: RT:1:1
      Originator: 11.0.0.1, Cluster list: 20.20.20.20
      EVPN ESI: ffff.ffff.ffff.ffff.ff01, Gateway Address : fec0::254
```

```
Router# show bgp l2vpn evpn neighbors 20.0.0.1 detail
Fri Aug 21 00:25:37.383 PDT

BGP neighbor is 20.0.0.1
 Remote AS 100, local AS 100, internal link
 Remote router ID 20.20.20.20
  BGP state = Established, up for 00:08:58
  NSR State: NSR Ready
  Last read 00:00:34, Last read before reset 00:00:00
  Hold time is 180, keepalive interval is 60 seconds
  Configured hold time: 180, keepalive: 60, min acceptable hold time: 3
  Last write 00:00:36, attempted 19, written 19
  Second last write 00:01:36, attempted 143, written 143
  Last write before reset 00:00:00, attempted 0, written 0
  Second last write before reset 00:00:00, attempted 0, written 0
  Last write pulse rcvd  Aug 21 00:25:03.667 last full not set pulse count 33
  Last write pulse rcvd before reset 00:00:00
  Socket not armed for io, armed for read, armed for write
  Last write thread event before reset 00:00:00, second last 00:00:00
  Last KA expiry before reset 00:00:00, second last 00:00:00
  Last KA error before reset 00:00:00, KA not sent 00:00:00
  Last KA start before reset 00:00:00, second last 00:00:00
  Precedence: internet
  Non-stop routing is enabled
  Entered Neighbor NSR TCP mode:
    TCP Initial Sync :              Aug 21 00:18:07.291
    TCP Initial Sync Phase Two :    Aug 21 00:18:07.319
    TCP Initial Sync Done :         Aug 21 00:18:08.334
  Multi-protocol capability received
  Neighbor capabilities:            Adv         Rcvd
    Route refresh:                  Yes         Yes
    4-byte AS:                      Yes         Yes
    Address family VPNv4 Unicast:   Yes         No
    Address family VPNv6 Unicast:   Yes         No
```

```
    Address family L2VPN EVPN:      Yes         Yes
  Message stats:
    InQ depth: 0, OutQ depth: 0
                    Last_Sent               Sent  Last_Rcvd               Rcvd
    Open:           Aug 21 00:16:38.087        1  Aug 21 00:16:40.123        1
    Notification:   ---                        0  ---                        0
    Update:         Aug 21 00:24:01.421        9  Aug 21 00:24:03.652       13
    Keepalive:      Aug 21 00:25:01.434        8  Aug 21 00:25:03.667        9
    Route_Refresh:  Aug 21 00:24:01.377        3  ---                        0
    Total:                                    21                           23
  Minimum time between advertisement runs is 0 secs
  Inbound message logging enabled, 3 messages buffered
  Outbound message logging enabled, 3 messages buffered

 For Address Family: VPNv4 Unicast
  BGP neighbor version 35
  Update group: 0.3 Filter-group: 0.1  No Refresh request being processed
  Advertise Reorigination Enabled
  Advertise AFI EoR can be sent
  Route refresh request: received 0, sent 0
  0 accepted prefixes, 0 are bestpaths
  Cumulative no. of prefixes denied: 0.
  Prefix advertised 4, suppressed 0, withdrawn 0
  Maximum prefixes allowed 2097152
  Threshold for warning message 75%, restart interval 0 min
  AIGP is enabled
  An EoR was not received during read-only mode
  Last ack version 35, Last synced ack version 35
  Outstanding version objects: current 0, max 1
  Additional-paths operation: None
  Send Multicast Attributes

 For Address Family: VPNv6 Unicast
  BGP neighbor version 29
  Update group: 0.3 Filter-group: 0.1  No Refresh request being processed
  Advertise Reorigination Enabled
  Advertise AFI EoR can be sent
  Route refresh request: received 0, sent 0
  0 accepted prefixes, 0 are bestpaths
  Cumulative no. of prefixes denied: 0.
  Prefix advertised 0, suppressed 0, withdrawn 0
  Maximum prefixes allowed 1048576
  Threshold for warning message 75%, restart interval 0 min
  AIGP is enabled
  An EoR was not received during read-only mode
  Last ack version 29, Last synced ack version 29
  Outstanding version objects: current 0, max 0
  Additional-paths operation: None
  Send Multicast Attributes
  Advertise VPNv4 routes enabled with Reoriginate,Local with stitching-RT option

 For Address Family: L2VPN EVPN
  BGP neighbor version 18
  Update group: 0.2 Filter-group: 0.1  No Refresh request being processed
  Route refresh request: received 0, sent 3
  8 accepted prefixes, 8 are bestpaths
  Cumulative no. of prefixes denied: 0.
  Prefix advertised 4, suppressed 0, withdrawn 6
  Maximum prefixes allowed 2097152
  Threshold for warning message 75%, restart interval 0 min
  AIGP is enabled
  An EoR was received during read-only mode
  Last ack version 18, Last synced ack version 18
  Outstanding version objects: current 0, max 2
```

```
  Additional-paths operation: None
  Send Multicast Attributes
  Advertise VPNv4 routes enabled with Reoriginate, option
  Advertise VPNv6 routes is enabled with Reoriginate, option
  Import Stitching is enabled for this neighbor address-family
  Import Reoriginate is enabled for this neighbor address-family

  Connections established 1; dropped 0
  Local host: 30.0.0.1, Local port: 59405, IF Handle: 0x00000000
  Foreign host: 20.0.0.1, Foreign port: 179
  Last reset 00:00:00
```

At the end of each one AFI VPNv4, VPNv6, or L2VPN EVPN, you can see import and advertise information based on the configuration.

```
Router# show bgp sessions

Fri Aug 21 00:25:57.216 PDT

Neighbor        VRF                  Spk    AS   InQ  OutQ  NBRState     NSRState
20.0.0.1        default                0   100     0     0  Established  NSR Ready[PP]
32.0.0.2        default                0   200     0     0  Established  NSR Ready


Router# show bgp vpnv4 unicast

Fri Aug 21 00:28:41.253 PDT
BGP router identifier 30.30.30.30, local AS number 100
BGP generic scan interval 60 secs
Non-stop routing is enabled
BGP table state: Active
Table ID: 0x0   RD version: 0
BGP main routing table version 39
BGP NSR Initial initsync version 4 (Reached)
BGP NSR/ISSU Sync-Group versions 39/0
BGP scan interval 60 secs

Status codes: s suppressed, d damped, h history, * valid, > best
              i - internal, r RIB-failure, S stale, N Nexthop-discard
Origin codes: i - IGP, e - EGP, ? - incomplete
   Network            Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 1:1
*> 10.0.0.1/8         32.0.0.2                               0 200 300 i
*> 10.0.0.2/8         32.0.0.2                               0 200 300 i
Route Distinguisher: 30.30.30.30:0 (default for vrf foo)
*> 10.0.0.1/8         32.0.0.2                               0 200 300 i
*> 10.0.0.2/8         32.0.0.2                               0 200 300 i
*>i100.1.1.1/32       172.16.0.1                  100        0 i
*>i100.1.1.2/32       172.16.0.1                  100        0 i
*>i200.1.1.1/32       172.16.0.1                  100        0 i
*>i200.1.1.2/32       172.16.0.1                  100        0 i


Router# show bgp vpnv4 unicast rd 192.168.0.1 10.0.0.1/8 detail

Fri Aug 21 00:28:57.824 PDT
BGP routing table entry for 10.0.0.1/8, Route Distinguisher: 192.168.0.1
Versions:
  Process           bRIB/RIB  SendTblVer
  Speaker                26          26
    Flags: 0x04103001+0x00000000;
Last Modified: Aug 21 00:24:01.000 for 00:04:58
Paths: (1 available, best #1)
  Advertised to peers (in unique update groups):
```

```
    20.0.0.1
  Path #1: Received by speaker 0
  Flags: 0x4000c00005060001, import: 0x80
  Advertised to peers (in unique update groups):
    20.0.0.1
  200 300
    32.0.0.2 from 32.0.0.2 (40.40.40.40)
      Received Label 24001
      Origin IGP, localpref 100, valid, external, best, group-best, import-candidate,
imported, reoriginated with stitching-rt
      Received Path ID 0, Local Path ID 1, version 26
      Extended community: RT: 1:2
      Source AFI: VPNv4 Unicast, Source VRF: default, Source Route Distinguisher: 1:1


Router# show bgp vrf foo

Fri Aug 21 00:24:36.523 PDT
BGP VRF foo, state: Active
BGP Route Distinguisher: 192.168.0.1:0
VRF ID: 0x60000002
BGP router identifier 3192.168.0.1, local AS number 100
Non-stop routing is enabled
BGP table state: Active
Table ID: 0xe0000011   RD version: 35
BGP main routing table version 35
BGP NSR Initial initsync version 4 (Reached)
BGP NSR/ISSU Sync-Group versions 31/0

Status codes: s suppressed, d damped, h history, * valid, > best
              i - internal, r RIB-failure, S stale, N Nexthop-discard
Origin codes: i - IGP, e - EGP, ? - incomplete
   Network            Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 30.30.30.30:0 (default for vrf foo)
*> 10.0.0.1/8         172.16.0.1                             0 200 300 i
*> 10.0.0.2/8         172.16.0.1                             0 200 300 i
*>i100.1.1.1/32       172.16.0.1                  100      0 i
*>i100.1.1.2/32       172.16.0.1                   100      0 i
*>i200.1.1.1/32       172.16.0.1                   100      0 i
*>i200.1.1.2/32       172.16.0.1                  100      0 i

Processed 6 prefixes, 6 paths


Router# show bgp vrf foo ipv4 unicast 100.1.1.1/32 detail

Mon Dec  8 23:24:50.243 PST
BGP routing table entry for 100.1.1.1/32, Route Distinguisher:
192.168.0.1:0
Versions:
  Process           bRIB/RIB  SendTblVer
  Speaker                43          43
    Local Label: 24001 (with rewrite);
    Flags: 0x05081001+0x00000200;
Last Modified: Dec  8 18:04:21.000 for 05:20:30
Paths: (1 available, best #1)
  Advertised to PE peers (in unique update groups):
    32.0.0.2
  Path #1: Received by speaker 0
  Flags: 0x400061000d060005, import: 0x80
  Advertised to PE peers (in unique update groups):
    32.0.0.2
  Local
    172.16.0.1 (metric 2) from 20.0.0.1 (172.16.0.1)
      Received Label 1234
```

```
      Origin IGP, localpref 100, valid, internal, best, group-best, import-candidate,
imported, reoriginated
      Received Path ID 0, Local Path ID 1, version 43
      Extended community: RT:1:2
      Originator: 172.16.0.1, Cluster list: 20.20.20.20
      Source AFI: L2VPN EVPN, Source VRF: default, Source Route Distinguisher: 100:1


Router# show bgp vpnv4 unicast update-group

Fri Aug 21 00:27:57.910 PDT

Update group for VPNv4 Unicast, index 0.1:
  Attributes:
    Outbound policy: pass
    First neighbor AS: 200
    Send communities
    Send GSHUT community if originated
    Send extended communities
    4-byte AS capable
    Send Re-originated VPN routes
    Send multicast attributes
    Minimum advertisement interval: 30 secs
  Update group desynchronized: 0
  Sub-groups merged: 0
  Number of refresh subgroups: 0
  Messages formatted: 8, replicated: 8
  All neighbors are assigned to sub-group(s)
    Neighbors in sub-group: 0.2, Filter-Groups num:1
     Neighbors in filter-group: 0.2(RT num: 0)
      32.0.0.2

Update group for VPNv4 Unicast, index 0.3:
  Attributes:
    Neighbor sessions are IPv4
    Internal
    Common admin
    First neighbor AS: 100
    Send communities
    Send GSHUT community if originated
    Send extended communities
    4-byte AS capable
    Send AIGP
    Send Re-originated VPN routes
    Send multicast attributes
    Minimum advertisement interval: 0 secs
  Update group desynchronized: 0
  Sub-groups merged: 0
  Number of refresh subgroups: 0
  Messages formatted: 2, replicated: 2
  All neighbors are assigned to sub-group(s)
    Neighbors in sub-group: 0.1, Filter-Groups num:1
     Neighbors in filter-group: 0.1(RT num: 0)
      20.0.0.1


Router# show bgp l2vpn evpn update-group

Fri Aug 21 00:27:42.786 PDT

Update group for L2VPN EVPN, index 0.2:
  Attributes:
    Neighbor sessions are IPv4
    Internal
    Common admin
```

```
  First neighbor AS: 100
  Send communities
  Send GSHUT community if originated
  Send extended communities
  4-byte AS capable
  Send AIGP
  Send multicast attributes
  Minimum advertisement interval: 0 secs
Update group desynchronized: 0
Sub-groups merged: 0
Number of refresh subgroups: 0
Messages formatted: 4, replicated: 4
All neighbors are assigned to sub-group(s)
  Neighbors in sub-group: 0.1, Filter-Groups num:1
   Neighbors in filter-group: 0.1(RT num: 0)
    20.0.0.1
```

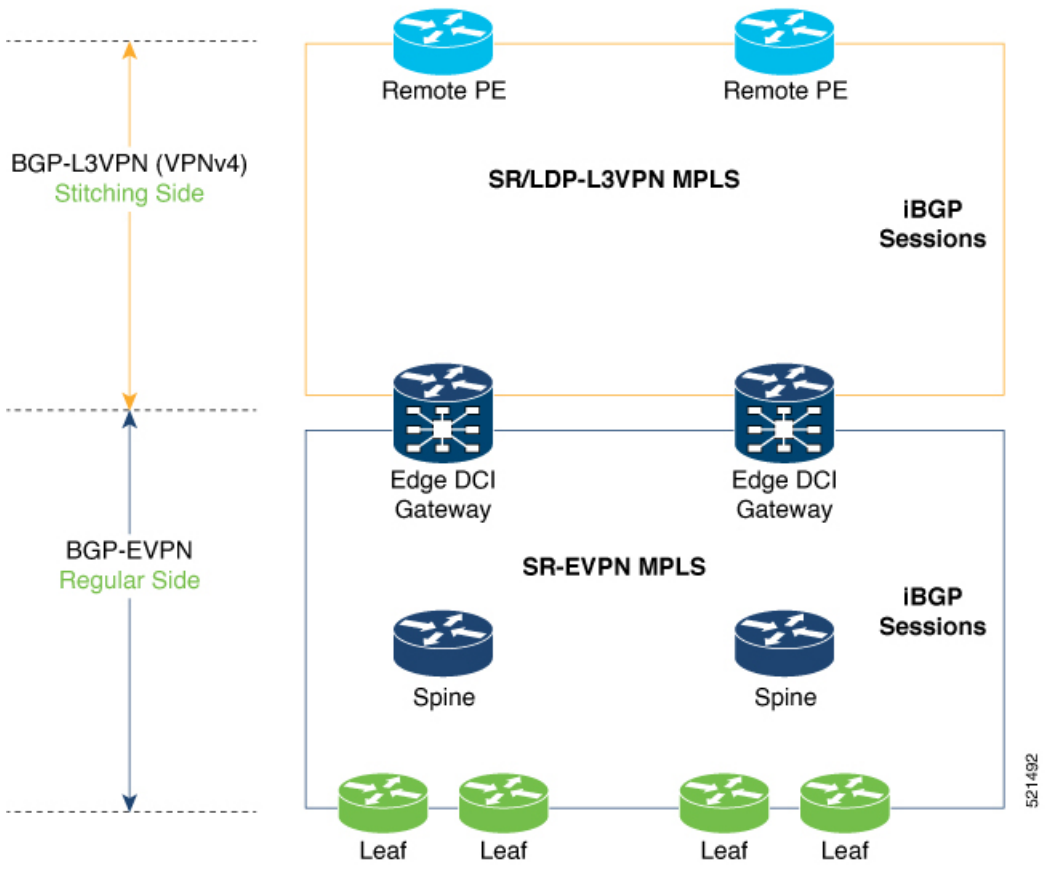
EVPN-Regular RT and VPNv4-Stitching RT

For each VRF on the DCI gateway, there are two sets of manually configured import and export route-targets for EVPN as regular side and VPNv4 as stitching side. Consider the following sets:

- Data Center Route-Targets for EVPN associated with EVPN BGP neighbor (Regular RT)
- MPLS L3VPN Route-Targets for VPNv4 or VPNv6 associated with L3VPN BGP neighbor (Stitching RT)

This separation of RTs enables the two sets of RTs to be independently configured. The RTs associated with the EVPN BGP neighbor does not require the keyword, it remains a normal configuration. The RTs associated with the L3VPN BGP neighbor require **stitching-rt** keyword under VRF configuration.

The following topology shows regular or normal and stitching side.



Route Targets

The RTs associated with the L3VPN BGP neighbor are labelled as stitching RTs. The RTs associated with the EVPN BGP neighbor are normal RTs.

Route Re-Origination

Consider control plane information propagation by the edge DCI gateway from the L3VPN (stitching side) to the Data Center (regular/normal side). Edge DCI gateway advertises to its BGP EVPN neighbor the routes that are re-originated after importing them from the L3VPN BGP neighbor. For this case of VPNv4 or VPNv6 routes being propagated to the BGP EVPN neighbors (Data Center neighbors), re-originating the routes refers to replacing the stitching route-targets with the local route-target values (regular/normal) associated with the BGP EVPN neighbors.

Local VPNv4 or VPNv6 Route Advertisement

On the edge DCI gateway, the locally sourced VPNv4 or VPNv6 routes (any CE directly connected not using L2VPN with BD/EVI/BVI, using only regular L3 VRF) can be advertised to the BGP EVPN neighbors with the normal route targets (RTs) configured for the VRF or the stitching RTs associated with the BGP EVPN neighbors. By default, these routes are advertised with the normal route targets to the BGP EVPN Neighbors (regular/normal side)

VPNv4 neighbors require an additional configuration on the existing legacy VRF to allow these routes to be advertised to VPNv4 RR or remote PEs. Configure **stitching-rt** keyword on existing VRF under import/export RT.

Route Distinguishers

The Router Distinguisher (RD) associated per VRF must be unique per PE in the network. There are few available options to keep unique RD per device:

- Manual configuration: You must manually assign a unique value per device in the network. For example, in this scenario:
  - Leaf (ToR) = RD 1
  - Edge DCI Gateway = RD 2
  - Remote PE = RD 3
- Use **rd auto** command under VRF. To assign a unique route distinguisher for each router, you must ensure that each router has a unique BGP router-id. If so, the **rd auto** command assigns a Type 1 route distinguisher to the VRF using the following format: *ip-address:number*. The IP address is specified by the BGP router-id statement and the number (which is derived as an unused index in the 0 to 65535 range) is unique across the VRFs.



Note In a DCI deployment, for route re-originate with stitching-rt for a particular VRF, using the same Route Distinguisher (RD) between edge DCI gateway and MPLS-VPN PE or same RD between edge DCI gateway and Leaf (ToR) is not supported.

Configure EVPN-Regular RT and VPNv4-Stitching RT

This section describes tasks to configure EVPN-Regular RT and VPNv4-Stitching RT. Perform the following tasks to complete the configuration:

- Configure Leaf (ToR)
- Configure Spine-RR (Route Reflector)
- Configure Edge DCI Gateway
- Configure EVPN BGP neighbor and route advertisements
- Configure L3VPN BGP neighbor relationship and route advertisements

Configure Leaf (ToR)

Configure VRF in Leaf (ToR) at BGP-EVPN (regular/normal side). Note that the **stitching-rt** keyword is not required.

```
vrf data-center1
 address-family ipv4 unicast
  import route-target
   1:2                              // BGP - EVPN (Regular/Normal Side)
!
```

```
  export route-target
   1:2                            // BGP - EVPN (Regular/Normal Side)
  !
router bgp 100
  neighbor 10.10.1.1              // Spine Loopback IP Address
    address-family l2vpn evpn
       advertise vpnv4 unicast
       advertise vpnv6 unicast
!
```

Note Advertise vpnv4/vpnv6 unicast enables local learned regular L3 VRF prefixes to be advertised as EVPN prefixes to BGP-EVPN neighbor. This means any local prefixes such as PE-CE without L2VPN with BD/EVI/BVI configuration. If all the services are pure EVPN with L2VPN with BD/EVI/BVI configuration these commands are not required.

Configure Spine-RR

Configure Spine RR with Leaf (ToR) and edge DCI gateway as RR client for AFI L2VPN EVPN.

```
// VRF Config is not required //
router bgp 100
  neighbor 10.10.2.1                       // Leaf (ToR) Loopback IP Address
    address-family l2vpn evpn
       route-reflector-client
  !
  neighbor 10.10.3.1                       // Edge DCI Gateway  Loopback IP Address
    address-family l2vpn evpn
       route-reflector-client
!
```

Configure Edge DCI Gateway

You can configure DCI with the same VRF as Leaf (ToR). Use the same RT as remote PE for L3VPN network or the same VRF if that is possible.

Configure VRF and Route Targets Import and Export rules

Perform the following steps to configure VRF and define route targets to be used for import and export of forwarding information.

```
vrf data-center1
 address-family ipv4 unicast
  import route-target
   1:1 stitching                   // BGP - L3VPN (Stitching Side)
   1:2                             // BGP - EVPN (Regular/normal Side)
!
  export route-target
   1:1 stitching                   // BGP - L3VPN (Stitching Side)
   1:2                             // BGP - EVPN (Regular/normal Side)
!
```

Configure EVPN BGP Neighbor and Route Advertisements

Perform this task on the edge DCI gateway to configure BGP neighbor relationship and route advertisements with the EVPN BGP neighbor.

```
router bgp 100
 address-family l2vpn evpn
!
 neighbor 10.10.1.1          // Spine Loopback IP Address
  address-family l2vpn evpn
   import re-originate stitching-rt //Imp EVPN RT 1:2, re-originate VPNv4 1:1
   advertise vpnv4 unicast re-originated //Send routes VPNv4 RT 1:1
!
```

Configure L3VPN BGP Neighbor Relationship and Route Advertisements

Perform the following steps to configure BGP neighbor relationship and route advertisements with the L3VPN BGP neighbor.

```
router bgp 100
 address-family vpnv4 unicast
!
 neighbor 10.10.1.1          // Spine Loopback IP Address
  address-family vpnv4 unicast     // Same config for VPNv6
   import stitching-rt re-originate // Imp VPNv4 1:1, reoriginate EVPN 1:2
   advertise vpnv4 unicast re-originated stitching-rt //Send Routes EVPN 1:2
   advertise vpnv6 unicast re-originated stitching-rt //Send Routes EVPN 1:2
!
```

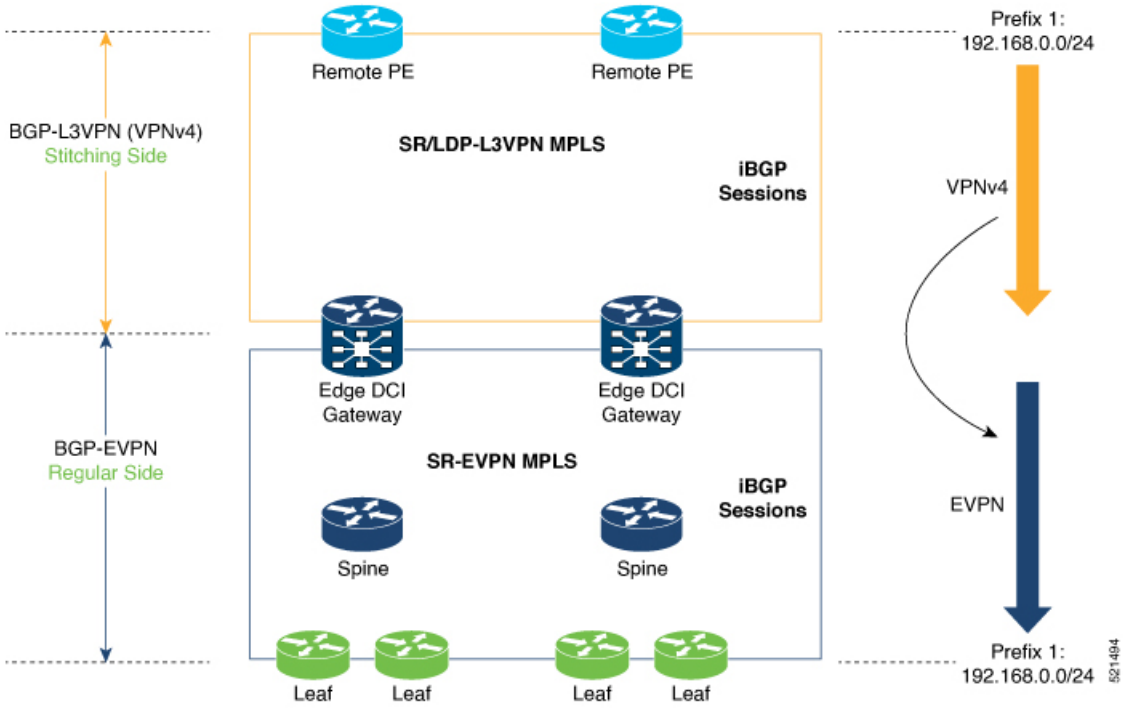
Note The **stitching-rt** applies for L3VPN RT and EVPN RT does not require the **stitching-rt** for this use case.

If there are existing regular local L3 VRF without L2VPN with BD/EVI/BVI in these devices, configure import/export Stitching-RT for existing VRFs to advertise to L3VPN RR or remote PEs.

Configuration applies in two directions:

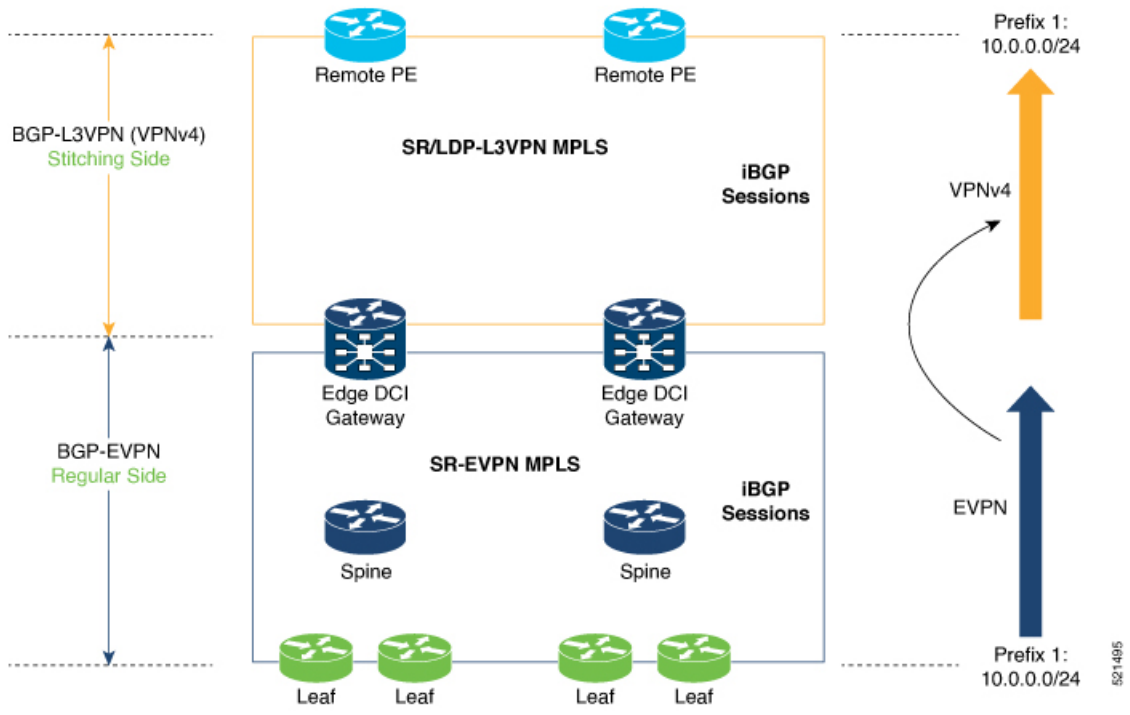
- Stitching from VPNv4 to EVPN routes. Prefixes received from MPLS L3VPN network and re-originated as EVPN prefixes towards Data Center Spine RR and Leaf (ToR)

  1. Importing VPNv4 routes with **import stitching-rt re-originate** command under AFI VPNv4 UNICAST. This command imports routes using RT 1:1 stitching-rt and then re-originate with BGP EVPN 1:2
  2. Advertising re-originated EVPN routes with VPNv4 RT with **advertise vpvn4 unicast re-originated** command under AFI L2VPN EVPN. This command advertises routes from MPLS L3VPN network (VPNv4) to BGP EVPN neighbors inside Data Center (Spine RR and then Leaf (ToR)), re-originating these routes using BGP EVPN 1:2.



- Stitching from EVPN to VPNv4 routes. Prefixes received from BGP-EVPN Data Center and re-originated as MPLS L3VPN prefixes towards VPNv4 RR or remote PE in L3VPN network.

  1. Importing EVPN routes with **import re-originate stitching-rt** command under AFI L2VPN EVPN. This command imports routes using RT 1:2 and then re-originate with VPNv4 RT 1:1 **stitching-rt**.
  2. Advertising re-originated EVPN routes with VPNv4 RT with **advertise vpvn4 unicast re-originated stitching-rt** command under AFI VPNv4 UNICAST. This command advertises routes from EVPN Data Center to VPNv4 RR or remote PEs, re-originating these routes using VPNv4 RT 1:1 **stitching-rt** .



Verification of Edge DCI Gateway Configuration

```
Router# show bgp l2vpn evpn

Fri Aug 21 00:24:10.773 PDT
BGP router identifier 30.30.30.30, local AS number 100
BGP generic scan interval 60 secs
Non-stop routing is enabled
BGP table state: Active
Table ID: 0x0   RD version: 0
BGP main routing table version 16
BGP NSR Initial initsync version 1 (Reached)
BGP NSR/ISSU Sync-Group versions 16/0
BGP scan interval 60 secs

Status codes: s suppressed, d damped, h history, * valid, > best
     i - internal, r RIB-failure, S stale, N Nexthop-discard
Origin codes: i - IGP, e - EGP, ? - incomplete
   Network            Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 100:1
*>i[2][10000][48][0226.51bd.c81c][32][200::1001]/232
     11.0.0.1                       100      0 i
*>i[2][10000][48][0226.51bd.c81c][32][200:1::1001]/232
     11.0.0.1                       100      0 i
*>i[2][10000][48][0226.51bd.c81c][32][200.1.1.1]/136
        11.0.0.1                       100      0 i
*>i[2][10000][48][0226.51bd.c81c][32][200.1.1.2]/136
     11.0.0.1                       100      0 i
*>i[5][4231][32][100.1.1.1]/80
     11.0.0.1                       100      0 i
*>i[5][4231][32][100.1.1.2]/80
     11.0.0.1                       100      0 i
*>i[5][4231][112][fec0::1001]/176
     11.0.0.1                       100      0 i
*>i[5][4232][112][fec0::1:1001]/176
```

```
     11.0.0.1                      100      0 i

Processed 8 prefixes, 8 paths
```

```
Router# show bgp l2vpn evpn rd 100:1 [5][4231][112][fec0::1001]/176 detail
```

```
Fri Aug 21 00:34:43.747 PDT
BGP routing table entry for [5][4231][112][fec0::1001]/176, Route Distinguisher: 100:1
Versions:
  Process           bRIB/RIB  SendTblVer
  Speaker                 5           5
    Flags: 0x04040001+0x00000000;
Last Modified: Aug 21 00:16:58.000 for 00:17:46
Paths: (1 available, best #1)
  Not advertised to any peer
  Path #1: Received by speaker 0
  Flags: 0x4000600025060005, import: 0x3f
  Not advertised to any peer
  Local
    11.0.0.1 (metric 2) from 20.0.0.1 (11.0.0.1)
      Received Label 16001
      Origin IGP, localpref 100, valid, internal, best, group-best, import-candidate,
reoriginate stitching-rt, not-in-vrf
      Received Path ID 0, Local Path ID 1, version 5
      Extended community: Flags 0x6: RT:1:1
      Originator: 11.0.0.1, Cluster list: 20.20.20.20
      EVPN ESI: ffff.ffff.ffff.ffff.ff01, Gateway Address : fec0::254
```

The main difference with scenario 1 is that the prefixes have a **reoriginate stitching-rt** keyword on the output versus scenario 1 having just reoriginate.

```
Router# show bgp l2vpn evpn neighbors 20.0.0.1 detail
```

```
Fri Aug 21 00:25:37.383 PDT

BGP neighbor is 20.0.0.1
 Remote AS 100, local AS 100, internal link
 Remote router ID 20.20.20.20
  BGP state = Established, up for 00:08:58
  NSR State: NSR Ready
  Last read 00:00:34, Last read before reset 00:00:00
  Hold time is 180, keepalive interval is 60 seconds
  Configured hold time: 180, keepalive: 60, min acceptable hold time: 3
  Last write 00:00:36, attempted 19, written 19
  Second last write 00:01:36, attempted 143, written 143
  Last write before reset 00:00:00, attempted 0, written 0
  Second last write before reset 00:00:00, attempted 0, written 0
  Last write pulse rcvd  Aug 21 00:25:03.667 last full not set pulse count 33
  Last write pulse rcvd before reset 00:00:00
  Socket not armed for io, armed for read, armed for write
  Last write thread event before reset 00:00:00, second last 00:00:00
  Last KA expiry before reset 00:00:00, second last 00:00:00
  Last KA error before reset 00:00:00, KA not sent 00:00:00
  Last KA start before reset 00:00:00, second last 00:00:00
  Precedence: internet
  Non-stop routing is enabled
  Entered Neighbor NSR TCP mode:
    TCP Initial Sync :              Aug 21 00:18:07.291
    TCP Initial Sync Phase Two :    Aug 21 00:18:07.319
    TCP Initial Sync Done :         Aug 21 00:18:08.334
  Multi-protocol capability received
  Neighbor capabilities:            Adv         Rcvd
    Route refresh:                  Yes         Yes
    4-byte AS:                      Yes         Yes
    Address family VPNv4 Unicast:   Yes         No
```

```
  Address family VPNv6 Unicast:   Yes         No
  Address family L2VPN EVPN:      Yes         Yes
Message stats:
  InQ depth: 0, OutQ depth: 0
                 Last_Sent               Sent  Last_Rcvd               Rcvd
  Open:          Aug 21 00:16:38.087        1  Aug 21 00:16:40.123        1
  Notification:  ---                        0  ---                        0
  Update:        Aug 21 00:24:01.421        9  Aug 21 00:24:03.652       13
  Keepalive:     Aug 21 00:25:01.434        8  Aug 21 00:25:03.667        9
  Route_Refresh: Aug 21 00:24:01.377        3  ---                        0
  Total:                                   21                           23
Minimum time between advertisement runs is 0 secs
Inbound message logging enabled, 3 messages buffered
Outbound message logging enabled, 3 messages buffered

For Address Family: VPNv4 Unicast
BGP neighbor version 35
Update group: 0.3 Filter-group: 0.1  No Refresh request being processed
Advertise Reorigination Enabled
Advertise AFI EoR can be sent
Route refresh request: received 0, sent 0
0 accepted prefixes, 0 are bestpaths
Cumulative no. of prefixes denied: 0.
Prefix advertised 4, suppressed 0, withdrawn 0
Maximum prefixes allowed 2097152
Threshold for warning message 75%, restart interval 0 min
AIGP is enabled
An EoR was not received during read-only mode
Last ack version 35, Last synced ack version 35
Outstanding version objects: current 0, max 1
Additional-paths operation: None
Send Multicast Attributes

For Address Family: VPNv6 Unicast
BGP neighbor version 29
Update group: 0.3 Filter-group: 0.1  No Refresh request being processed
Advertise Reorigination Enabled
Advertise AFI EoR can be sent
Route refresh request: received 0, sent 0
0 accepted prefixes, 0 are bestpaths
Cumulative no. of prefixes denied: 0.
Prefix advertised 0, suppressed 0, withdrawn 0
Maximum prefixes allowed 1048576
Threshold for warning message 75%, restart interval 0 min
AIGP is enabled
An EoR was not received during read-only mode
Last ack version 29, Last synced ack version 29
Outstanding version objects: current 0, max 0
Additional-paths operation: None
Send Multicast Attributes
Advertise VPNv4 routes enabled with Reoriginate,Local with stitching-RT option

For Address Family: L2VPN EVPN
BGP neighbor version 18
Update group: 0.2 Filter-group: 0.1  No Refresh request being processed
Route refresh request: received 0, sent 3
8 accepted prefixes, 8 are bestpaths
Cumulative no. of prefixes denied: 0.
Prefix advertised 4, suppressed 0, withdrawn 6
Maximum prefixes allowed 2097152
Threshold for warning message 75%, restart interval 0 min
AIGP is enabled
An EoR was received during read-only mode
Last ack version 18, Last synced ack version 18
```

```
  Outstanding version objects: current 0, max 2
  Additional-paths operation: None
  Send Multicast Attributes
  Advertise VPNv4 routes enabled with Reoriginate, option
  Advertise VPNv6 routes is enabled with Reoriginate, option
  Import Reoriginate is enabled for this neighbor address-family

  Connections established 1; dropped 0
  Local host: 30.0.0.1, Local port: 59405, IF Handle: 0x00000000
  Foreign host: 20.0.0.1, Foreign port: 179
  Last reset 00:00:00
```

At the end of each one AFI VPNv4, VPNv6, or L2VPN EVPN, you can see import and advertise information based on the configuration.

Based on whether stitching-side or regular side, import stitching applies on VPNv4 AFI. In Scenario 1 you can see import stitching under L2VPN EVPN.

```
Router# show bgp sessions

Fri Aug 21 00:25:57.216 PDT

Neighbor        VRF                  Spk    AS   InQ  OutQ  NBRState     NSRState
20.0.0.1        default                0   100     0     0  Established  NSR Ready[PP]
32.0.0.2        default                0   200     0     0  Established  NSR Ready
```

```
Router# show bgp vpnv4 unicast

Fri Aug 21 00:28:41.253 PDT
BGP router identifier 30.30.30.30, local AS number 100
BGP generic scan interval 60 secs
Non-stop routing is enabled
BGP table state: Active
Table ID: 0x0   RD version: 0
BGP main routing table version 39
BGP NSR Initial initsync version 4 (Reached)
BGP NSR/ISSU Sync-Group versions 39/0
BGP scan interval 60 secs

Status codes: s suppressed, d damped, h history, * valid, > best
              i - internal, r RIB-failure, S stale, N Nexthop-discard
Origin codes: i - IGP, e - EGP, ? - incomplete
   Network            Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 1:1
*> 1.1.1.0/24         32.0.0.2                               0 200 300 i
*> 1.1.2.0/24         32.0.0.2                               0 200 300 i
Route Distinguisher: 30.30.30.30:0 (default for vrf foo)
*> 1.1.1.0/24         32.0.0.2                               0 200 300 i
*> 1.1.2.0/24         32.0.0.2                               0 200 300 i
*>i100.1.1.1/32       11.0.0.1                    100        0 i
*>i100.1.1.2/32       11.0.0.1                    100        0 i
*>i200.1.1.1/32       11.0.0.1                    100        0 i
*>i200.1.1.2/32       11.0.0.1                    100        0 i
```

In origin IGP line, you can see that the prefix was reoriginated with regular-RT.

```
Router# show bgp vpnv4 unicast rd 30.30.30.30:0 1.1.1.0/24 detail

Fri Aug 21 00:28:57.824 PDT
BGP routing table entry for 1.1.1.0/24, Route Distinguisher: 30.30.30.30:0
Versions:
  Process           bRIB/RIB  SendTblVer
  Speaker                26          26
    Flags: 0x04103001+0x00000000;
Last Modified: Aug 21 00:24:01.000 for 00:04:58
```

```
Paths: (1 available, best #1)
  Advertised to peers (in unique update groups):
    20.0.0.1
  Path #1: Received by speaker 0
  Flags: 0x4000c00005060001, import: 0x80
  Advertised to peers (in unique update groups):
    20.0.0.1
  200 300
    32.0.0.2 from 32.0.0.2 (40.40.40.40)
      Received Label 24001
      Origin IGP, localpref 100, valid, external, best, group-best, import-candidate,
imported, reoriginated
      Received Path ID 0, Local Path ID 1, version 26
      Extended community: RT: 1:2
      Source AFI: VPNv4 Unicast, Source VRF: default, Source Route Distinguisher: 1:1
```

```
Router# show bgp vrf foo

Fri Aug 21 00:24:36.523 PDT
BGP VRF foo, state: Active
BGP Route Distinguisher: 30.30.30.30:0
VRF ID: 0x60000002
BGP router identifier 30.30.30.30, local AS number 100
Non-stop routing is enabled
BGP table state: Active
Table ID: 0xe0000011   RD version: 35
BGP main routing table version 35
BGP NSR Initial initsync version 4 (Reached)
BGP NSR/ISSU Sync-Group versions 31/0

Status codes: s suppressed, d damped, h history, * valid, > best
              i - internal, r RIB-failure, S stale, N Nexthop-discard
Origin codes: i - IGP, e - EGP, ? - incomplete
   Network            Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 30.30.30.30:0 (default for vrf foo)
*> 1.1.1.0/24         32.0.0.2                               0 200 300 i
*> 1.1.2.0/24         32.0.0.2                               0 200 300 i
*>i100.1.1.1/32       11.0.0.1                 100           0 i
*>i100.1.1.2/32       11.0.0.1                 100           0 i
*>i200.1.1.1/32       11.0.0.1                 100           0 i
*>i200.1.1.2/32       11.0.0.1                 100           0 i

Processed 6 prefixes, 6 paths
```

```
Router# show bgp vrf foo ipv4 unicast 100.1.1.1/32 detail

Mon Dec  8 23:24:50.243 PST
BGP routing table entry for 100.1.1.1/32, Route Distinguisher:
30.30.30.30:0
Versions:
  Process           bRIB/RIB  SendTblVer
  Speaker                43          43
    Local Label: 24001 (with rewrite);
    Flags: 0x05081001+0x00000200;
Last Modified: Dec  8 18:04:21.000 for 05:20:30
Paths: (1 available, best #1)
  Advertised to PE peers (in unique update groups):
    32.0.0.2
  Path #1: Received by speaker 0
  Flags: 0x400061000d060005, import: 0x80
  Advertised to PE peers (in unique update groups):
    32.0.0.2
  Local
    11.0.0.1 (metric 2) from 20.0.0.1 (11.0.0.1)
      Received Label 1234
```

```
      Origin IGP, localpref 100, valid, internal, best, group-best, import-candidate,
imported, reoriginated with stitching-rt
      Received Path ID 0, Local Path ID 1, version 43
      Extended community: RT:1:2
      Originator: 11.0.0.1, Cluster list: 20.20.20.20
      Source AFI: L2VPN EVPN, Source VRF: default, Source Route Distinguisher: 100:1v
```

```
Router# show bgp vpnv4 unicast update-group

Fri Aug 21 00:27:57.910 PDT

Update group for VPNv4 Unicast, index 0.1:
  Attributes:
    Outbound policy: pass
    First neighbor AS: 200
    Send communities
    Send GSHUT community if originated
    Send extended communities
    4-byte AS capable
    Send Re-originated VPN routes
    Send multicast attributes
    Minimum advertisement interval: 30 secs
  Update group desynchronized: 0
  Sub-groups merged: 0
  Number of refresh subgroups: 0
  Messages formatted: 8, replicated: 8
  All neighbors are assigned to sub-group(s)
    Neighbors in sub-group: 0.2, Filter-Groups num:1
     Neighbors in filter-group: 0.2(RT num: 0)
      32.0.0.2

Update group for VPNv4 Unicast, index 0.3:
  Attributes:
    Neighbor sessions are IPv4
    Internal
    Common admin
    First neighbor AS: 100
    Send communities
    Send GSHUT community if originated
    Send extended communities
    4-byte AS capable
    Send AIGP
    Send Re-originated VPN routes
    Send multicast attributes
    Minimum advertisement interval: 0 secs
  Update group desynchronized: 0
  Sub-groups merged: 0
  Number of refresh subgroups: 0
  Messages formatted: 2, replicated: 2
  All neighbors are assigned to sub-group(s)
    Neighbors in sub-group: 0.1, Filter-Groups num:1
     Neighbors in filter-group: 0.1(RT num: 0)
      20.0.0.1
```

```
Router# show bgp l2vpn evpn update-group

Fri Aug 21 00:27:42.786 PDT

Update group for L2VPN EVPN, index 0.2:
  Attributes:
    Neighbor sessions are IPv4
    Internal
    Common admin
    First neighbor AS: 100
    Send communities
```

```
  Send GSHUT community if originated
  Send extended communities
  4-byte AS capable
  Send AIGP
  Send multicast attributes
  Minimum advertisement interval: 0 secs
Update group desynchronized: 0
Sub-groups merged: 0
Number of refresh subgroups: 0
Messages formatted: 4, replicated: 4
All neighbors are assigned to sub-group(s)
  Neighbors in sub-group: 0.1, Filter-Groups num:1
   Neighbors in filter-group: 0.1(RT num: 0)
    20.0.0.1
```