EVPN-VPWS Single Homing on Segment Routing

EVPN-VPWS single homing is a BGP control plane solution for point-to-point services. It has the ability to forward traffic from one network to another using Ethernet Segment without MAC lookup.

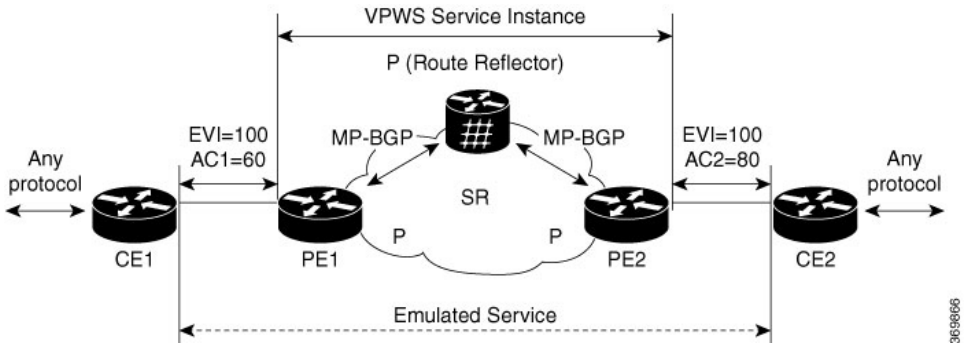
EVPN VPWS single homing works on both IP and SR core. IP core is used to support BGP while the SR core is used to switch packets between the endpoints.

Information About EVPN-VPWS

The EVPN-VPWS solution supports per EVI Ethernet Auto Discovery route. EVPN defines a new BGP Network Layer Reachability Information (NLRI) that is used to carry all EVPN routes. BGP Capabilities Advertisement is used to ensure that two speakers support EVPN NLRI (AFI 25, SAFI 70) as per RFC 4760.

The architecture for EVPN VPWS is that the PEs run Multi-Protocol BGP in control-plane. The following image describes the EVPN-VPWS over SR configuration:

Figure 1: EVPN-VPWS over SR Configuration



Benefits of EVPN-VPWS Single Homed

- Scalability is achieved without signaling pseudowires.
- There is ease of provisioning.
- Pseudowires (PWs) are not used.
- EVPN-VPWS Single Homed leverages BGP best-path selection (optimal forwarding).

Prerequisites for EVPN-VPWS

- BGP must be configured for EVPN SAFI.
- Segment routing must be configured and made preferred.
- CE-facing interface such as service instance, is Ethernet family without IP address on PE.
- BGP session between PEs with 'address-family l2vpn evpn' to exchange EVPN routes.
- A BGP route reflector is supported and configured.
- An IGP such as, the ISIS is used for IP reachability between the PEs, whereas BGP is used for next-hop reachability

Restrictions for EVPN-VPWS

- The combination of EVPN ID and VPWS Instance ID must be unique according to ASN.
- SR TE core is *not* supported.
- InterAS Option B is *not* supported.
- NSR is *not* supported for L2VPN family.
- Ensure NSF is configured on BGP, OSPF (iBGP), and MPLS.
- NSF is supported; however, neighbor flaps occur.
- Without NSF, when a Stateful Switchover (SSO) takes place, traffic drops for the L2VPN-EVP packets.
- ELB is *not* supported on EVPN.

Scaling Information

Number of EVPN VPWS service instances supported is 2000.

How to Configure EPVN-VPWS

The following steps are performed to configure EVPN-VPWS

- Configuring BGP for EVPN-VPWS

- Configuring EVPN-VPWS Instance

Configuring BGP for EVPN-VPWS

To configure EVPN-VPWS in BGP, follow these steps:

Procedure

```
router bgp 1
address-family l2vpn evpn
  neighbor 4.4.4.4 activate
  neighbor 4.4.4.4 send-community both
exit-address-family
```

Configuring EVPN-VPWS Instance

To configure EVPN VPWS instance, follow these steps:

Procedure

```
enable
configure terminal
l2vpn evpn instance 1 point-to-point
vpws context 1
  service target 1 source 1
  member GigabitEthernet0/0/6 service-instance 1
!
```

Configuring EVPN-VPWS on SR

To configure EVPN-VPWS on SR:

```
segment-routing mpls
 !
 set-attributes
  address-family ipv4
   sr-label-preferred
  exit-address-family
 !
 global-block 17000 23999
 !
 connected-prefix-sid-map
  address-family ipv4
   2.2.2.2/32 index 19 range 1
  exit-address-family

  router ospf 30
 router-id 2.2.2.2
 nsr
 nsf cisco
 segment-routing mpls
 segment-routing prefix-sid-map advertise-local
```

Rewrite for EVI Service Instance

You must run the rewrite command when the VLANs are mismatched on the remote ACs. This allows ingress traffic movement. To configure EVPN-VPWS service instance for rewrite, follow these steps:

Procedure

Rewrite on PE1:

```
interface GigabitEthernet0/0/6
service instance 1 ethernet
  encapsulation dot1q 1
!
```

Rewrite on CE1:

```
interface GigabitEthernet0/0/8
service instance 1 ethernet
  encapsulation dot1q 1
  rewrite ingress tag pop 1 symmetric
  bridge-domain 1
```

Configuring EVPN-VPWS for Logging

To configure EVPN-VPWS for logging, follow these steps:

Procedure

```
enable
configure terminal
l2vpn evpn logging vc-state
end
```

Verfiying EVPN-VPWS Instance

Verifying EVPN-VPWS Configuration

You can verify the configuration using the following show commands:

- **show l2vpn evpn vpws summary**
- **show l2vpn evpn vpws evi (<evpn-id> | all) [detail]**
- **show l2vpn evpn rib ead [per] |evi**
- **show ip bgp l2vpn evpn evi <evpn-id> context**
- **show l2vpn evpn memory**

This command displays a summary of L2VPN EVPN with total number of EVIs, VCs and routes.

```
show l2vpn evpn vpws summary
L2VPN EVPN VPWS:
  EVIs (point-to-point): 3
  Total VCs: 3
    3 up, 0 down, 0 admin-down, 0 hot-standby, 0 other
```

```
  BGP: ASN 1, address-family l2vpn evpn configured
  Router ID: 2.2.2.2
```

This command displays brief or detail info for EVIs.

```
show l2vpn evpn vpws evi 1
EVI     VCs     Up      Down    AdmDn   HotSby  Other
------- ------- ------- ------- ------- ------- -------
1       1       1       0       0       0       0
PE-1#show l2vpn evpn vpws evi all
PE-1#show l2vpn evpn vpws evi all


EVI     VCs     Up      Down    AdmDn   HotSby  Other
------- ------- ------- ------- ------- ------- -------
1       1       1       0       0       0       0
2       1       1       0       0       0       0
3       1       1       0       0       0       0

show l2vpn evpn vpws evi all detail

EVPN instance: 1 (point-to-point)
  RD: 2.2.2.2:1 (auto)
  Import-RTs: 1:1
  Export-RTs: 1:1
  Total VCs: 1
    1 up, 0 down, 0 admin-down, 0 hot-standby, 0 other


EVPN instance: 2 (point-to-point)
  RD: 2.2.2.2:2 (auto)
  Import-RTs: 1:2 100:100
  Export-RTs: 1:2 100:100
  Total VCs: 1
    1 up, 0 down, 0 admin-down, 0 hot-standby, 0 other


EVPN instance: 3 (point-to-point)
  RD: 2.2.2.2:3 (auto)
  Import-RTs: 1:3
  Export-RTs: 1:3
  Total VCs: 1
    1 up, 0 down, 0 admin-down, 0 hot-standby, 0 other


show l2vpn evpn vpws evi 1 detail

EVPN instance: 1 (point-to-point)
  RD: 2.2.2.2:1 (auto)
  Import-RTs: 1:1
  Export-RTs: 1:1
  Total VCs: 1
    1 up, 0 down, 0 admin-down, 0 hot-standby, 0 other
```

This command displays the contents of the global EVPN route.

```
show l2route evpn ead per-evi
  EVI       ETag  Prod                      ESI                   Next Hop(s)   Label
----- ---------- ----- ------------------------ ------------------------------ -------
    1          1 L2VPN                      N/A                          N/A      19
    1          1   BGP 0000.0000.0000.0000.0000                     4.4.4.4      16
    2          2 L2VPN                      N/A                          N/A      22
    2          2   BGP 0000.0000.0000.0000.0000                     4.4.4.4      24
    3          3 L2VPN                      N/A                          N/A      25
   3          3   BGP 0000.0000.0000.0000.0000                     4.4.4.4      29
```

This command displays the contents of the global route-target (RT).

```
show ip bgp l2vpn evpn evi 1 context
EVI evi_1 (EVI Id = 1); default RD 2.2.2.2:1
  Export EVPN route-target communities
    RT:1:1
  Import EVPN route-target communities
    RT:1:1
```

This command displays brief or detail EVPN memory usage.

```
show l2vpn evpn memory
  Allocator-Name                  In-use/Allocated            Count
  ------------------------------------------------------------------------------
  EVPN DB                    :        900/32820      (  2%) [     25] Chunk
  EVPN MGR DB                :        108/32820      (  0%) [      3] Chunk
  EVPN Mgr EVI chunk         :        792/10052      (  7%) [      3] Chunk
  EVPN Mgr Msg chunk         :          0/8484       (  0%) [      0] Chunk
  EVPN Mgr Thread            :       4468/5040       ( 88%) [     11]
  EVPN VPWS Thread           :       6304/6980       ( 90%) [     13]
  EVPN context chunk         :       2268/32820      (  6%) [      3] Chunk
  EVPN context handle table  :      35480/35584      ( 99%) [      2]
  EVPN dtrace elem per-cont  :      10512/32820      ( 32%) [    292] Chunk
  EVPN dtrace stridx         :    1194876/1194928    ( 99%) [      1]
  EVPN dtrace stridx freeli  :     132764/132816     ( 99%) [      1]
  EVPN dtrace stridx hash    :         40/92         ( 43%) [      1]
  EVPN dtrace stridx slots   :     132764/132816     ( 99%) [      1]
  EVPN dtrace stridx2slot    :     132764/132816     ( 99%) [      1]
  EVPN instance chunk        :        504/8484       (  5%) [      3] Chunk
  EVPN rt-db ee              :        168/376        ( 44%) [      4]
  EVPN rt-db rte             :        240/448        ( 53%) [      4]

  Total allocated: 1.716 Mb, 1758 Kb, 1800196 bytes
```

Verifying EVPN-VPWS Configuration for Logging

You can verify the logging using the **show l2vpn evpn vc** command.

This command displays brief information for VCs.

```
show l2vpn evpn vpws vc all
EVPN ID Source   Target   Type   Name/Interface                   Status
------- -------- -------- ------ -------------------------------- ----------
1       1        1        p2p    1                                up
                                 Gi0/0/6:1                        up
2       2        2        p2p    2                                up
                                 Gi0/0/6:2                        up
3       3        3        p2p    3                                up
                                 Gi0/0/6:3                        up
```

This command displays detail information for VCs.

```
show l2vpn evpn vpws vc all detail
EVPN name: 1, state: up, type: point-to-point
  EVPN ID: 1
  VPWS Service Instance ID: Source 1, Target 1
  Labels: Local 19, Remote 16
  Next Hop Address: 4.4.4.4
  Associated member interface Gi0/0/6 up, Gi0/0/6:1 status is up
  Dataplane:
    SSM segment/switch IDs: 4149/4139 (used), PWID: 3
  Rx Counters
    27840 input transit packets, 3397212 bytes
    0 drops
  Tx Counters
```

```
    27885 output transit packets, 3400188 bytes
    0 drops
  17 VC FSM state transitions, Last 10 shown
    RemUp: RemWait -> Act, Sun Sep 01 08:27:29.093 (2d07h ago)
    DpUp: Act -> Est, Sun Sep 01 08:27:29.113 (2d07h ago)
    LocDn: Est -> LocWait, Sun Sep 01 08:31:07.953 (2d07h ago)
    LocUp: LocWait -> RemWait, Sun Sep 01 08:31:19.665 (2d07h ago)
    RemUp: RemWait -> Act, Sun Sep 01 08:31:19.665 (2d07h ago)
    DpUp: Act -> Est, Sun Sep 01 08:31:19.681 (2d07h ago)
    LocDn: Est -> LocWait, Sun Sep 01 08:42:17.685 (2d07h ago)
    LocUp: LocWait -> RemWait, Sun Sep 01 08:44:23.869 (2d07h ago)
    RemUp: RemWait -> Act, Sun Sep 01 08:44:23.869 (2d07h ago)
    DpUp: Act -> Est, Sun Sep 01 08:44:23.933 (2d07h ago)

EVPN name: 2, state: up, type: point-to-point
  EVPN ID: 2
  VPWS Service Instance ID: Source 2, Target 2
  Labels: Local 22, Remote 24
  Next Hop Address: 4.4.4.4
  Associated member interface Gi0/0/6 up, Gi0/0/6:2 status is up
  Dataplane:
    SSM segment/switch IDs: 12342/8238 (used), PWID: 4
  Rx Counters
    21214 input transit packets, 2503252 bytes
    0 drops
  Tx Counters
    0 output transit packets, 0 bytes
    0 drops
  17 VC FSM state transitions, Last 10 shown
    RemUp: RemWait -> Act, Sun Sep 01 08:27:29.093 (2d07h ago)
    DpUp: Act -> Est, Sun Sep 01 08:27:29.113 (2d07h ago)
    LocDn: Est -> LocWait, Sun Sep 01 08:31:07.961 (2d07h ago)
    LocUp: LocWait -> RemWait, Sun Sep 01 08:31:19.665 (2d07h ago)
    RemUp: RemWait -> Act, Sun Sep 01 08:31:19.665 (2d07h ago)
    DpUp: Act -> Est, Sun Sep 01 08:31:19.681 (2d07h ago)
    LocDn: Est -> LocWait, Sun Sep 01 08:42:17.689 (2d07h ago)
    LocUp: LocWait -> RemWait, Sun Sep 01 08:44:23.873 (2d07h ago)
    RemUp: RemWait -> Act, Sun Sep 01 08:44:23.873 (2d07h ago)
    DpUp: Act -> Est, Sun Sep 01 08:44:23.937 (2d07h ago)

EVPN name: 3, state: up, type: point-to-point
  EVPN ID: 3
  VPWS Service Instance ID: Source 3, Target 3
  Labels: Local 25, Remote 29
  Next Hop Address: 4.4.4.4
  Associated member interface Gi0/0/6 up, Gi0/0/6:3 status is up
  Dataplane:
    SSM segment/switch IDs: 20539/12344 (used), PWID: 5
  Rx Counters
    2585 input transit packets, 305078 bytes
    0 drops
  Tx Counters
    2591 output transit packets, 305258 bytes
    0 drops
  8 VC FSM state transitions, Last 8 shown
    Prov: Idle -> Prov, Tue Sep 03 09:43:12.266 (06:39:15 ago)
    EviUp: Prov -> LocWait, Tue Sep 03 09:43:12.266 (06:39:15 ago)
    LocUp: LocWait -> RemWait, Tue Sep 03 09:43:12.266 (06:39:15 ago)
    RemUp: RemWait -> Act, Tue Sep 03 09:43:12.278 (06:39:15 ago)
    DpUp: Act -> Est, Tue Sep 03 09:43:12.294 (06:39:15 ago)
    RemDn: Est -> RemWait, Tue Sep 03 09:43:33.210 (06:38:54 ago)
    RemUp: RemWait -> Act, Tue Sep 03 09:43:33.234 (06:38:54 ago)
    DpUp: Act -> Est, Tue Sep 03 09:43:33.262 (06:38:54 ago)
```

Verifying EVPN-VPWS Configuration on SR

Use show segment-routing mpls connected-prefix-sid-map ipv4 and show segment-routing mpls state commands to verify EVPN-VPWS configuration on SR.

```
PE1#show segment-routing mpls connected-prefix-sid-map ipv4

               PREFIX_SID_CONN_MAP ALGO_0

    Prefix/masklen   SID Type Range Flags SRGB
        10.0.0.1/32    18 Indx     1         Y

               PREFIX_SID_PROTOCOL_ADV_MAP ALGO_0

    Prefix/masklen   SID Type Range Flags SRGB Source
        10.0.0.1/32    18 Indx     1         Y  IS-IS Level 1 0002.0000.0001
        2.2.2.2/32    19 Indx     1         Y  IS-IS Level 1 0002.0000.0006
        3.3.3.3/32    20 Indx     1         Y  IS-IS Level 1 0002.0000.0002
        4.4.4.4/32    21 Indx     1         Y  IS-IS Level 1 0002.0000.0003

PE1#show segment-routing mpls state
 Segment Routing MPLS State : ENABLED
```

Troubleshooting

Virtual Circuit (VC) is in Down state

EVPN VPWS protocol has no communication of VC state between endpoints. VC can be up on one end and down on the other end in the following cases:

- When the core-facing MPLS dataplane is down on one side only. For example, if loopback is configured with /24 on one-end but configured correctly with /32 at the other end.
- UUT has no remote EVPN EAD route from peer. This can happen in the following scenarios:
  - Peer never sent it.
  - Peer sent it, but RT mismatches. No intersection between UUT Import-RT and peer Export-RT.
  - Peer sent it, RT matches, but E-tag mismatches: For service E-tags, TGT/SRC, UUT has X/Y and peer has Y/Z.

Problem VC is in down state.

Possible Cause None

Solution Perform these steps to check whether the VC is not active:

- **Solution** Check if any VC is not active.
- **Solution** Identify EVIs that has not got an active VCs
- **Solution** Gather information for the EVIs that has not got an active VCs
- **Solution** Locate the inactive VCs for the EVI
- **Solution** Display detail information of the not active VC

Solution

```
show l2vpn evpn vpws vc all detail
EVPN name: vc100, state: up, type: point-to-point
  EVPN ID: 100
  VPWS Service Instance ID:  Source 1, Target 2
  Labels:  Local 16, Remote 16

// Must have a valid Local Label. If missing, contact support.

// Must have valid Remote Label. If missing, then there is no matching remote route.
Cross-check with BGP: 'show bgp l2vpn evpn [...] detail'.

  Next Hop Address: 192.168.0.3

// Must have valid Next Hop Address. If missing, then there is no matching remote route.
Cross-check with BGP: 'show bgp l2vpn evpn [...] detail'.

  Associated member Et0/0 is up, status is up

// AC must be up. If not up, check why.

  Dataplane:
    SSM segment/switch IDs: 4098/4097 (used), PWID: 1
  Rx Counters
    78 input transit packets, 26425 bytes
    0 drops
  Tx Counters
    79 output transit packets, 28240 bytes
    0 drops
  5 VC FSM state transitions, Last 5 shown
    Prov: Idle -> Prov, Tue Sep 29 13:15:37.848 (00:52:21 ago)
    AdmUp: Prov -> LocWait, Tue Sep 29 13:15:40.287 (00:52:18 ago)
    LocUp: LocWait -> RemWait, Tue Sep 29 13:15:40.287 (00:52:18 ago)
    RemUp: RemWait -> Act, Tue Sep 29 13:17:19.368 (00:50:39 ago)
    DpUp: Act -> Est, Tue Sep 29 13:17:19.371 (00:50:39 ago)

// Pay close attention to last line of VC FSM history. The format is:
// <Event>: <OldState> -> <NewState>
// Troubleshooting info appears below.
```

VC FSM History

Problem The state of the VC is Prov — Provisioned: VC is disabled.

Possible Cause None

Solution Perform these steps for a solution to the state:

- **Solution** Check BGP is running.
- **Solution** Check BGP 'address-family l2vpn evpn' is configured.
- **Solution** Check VC is not shutdown.

Problem The state of the VC is LocWait — Local-Wait: Waiting for local AC information to come up.

Possible Cause None

Solution Check AC is up.

Problem The state of the VC is Act — Activating: Control plane ok. Trying to activate dataplane.

Possible Cause None

- **Solution** Check core facing information is up.

- **Solution** Check Segment-Routing is configured and preferred.

Remote-Wait State

Problem The state of the VC is RemWait — Remote-Wait: Waiting for matching remote route.

Possible Cause This state occurs due to no matching remote route for the VC. A matching remote route means all of the following are true:

- Route is present in BGP. Requires a local EVI to have route target in the route.
- Remote path is best path.
- Route is present in global EVPN route.
- Route is present in EVI route. Requires the EVI to have route target in the route.
- Route has ETag which matches the VC source identity. (**service target <tgt-id> source <src-id>**).

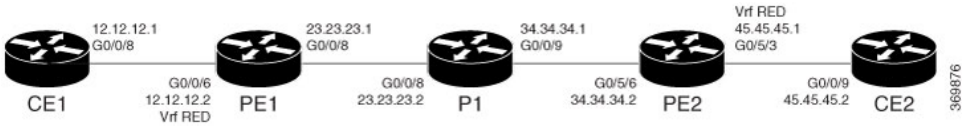
Solution Perform these steps to check whether the VC is in remote wait state:

Solution

- Check for EVI configuration mismatch.
- Check for VC configuration mismatch.
- Check if the remote route is present in BGP.
  - If no remote route then check if
    - remote route was discarded by BGP due to RT filter
    - peer did not send route to UUT
    - EVI or VC configuration mismatch
    - all the prerequisites are satisfied
  - If a remote route is present in global EVPN then check if the remote route is present in EVI route.
    - **Solution** Check for EVI or VC configuration mismatch.

Configuration Examples for EVPN-VPWS over SR

The following example has running configurations on PE1 and PE2:



Example: EVPN-VPWS over SR, PE-1 configuration

```
show run int lo0
Building configuration...

Current configuration : 63 bytes
!
interface Loopback0
ip address 2.2.2.2 255.255.255.255
end
```

```
PE-1#show run | sec router ospf 1
router ospf 1
router-id 2.2.2.2
segment-routing mpls
segment-routing prefix-sid-map advertise-local
network 2.2.2.2 0.0.0.0 area 0
network 23.23.23.0 0.0.0.255 area 0
bfd all-interfaces
PE-1#

segment-routing mpls
!
set-attributes
  address-family ipv4
   sr-label-preferred
  exit-address-family
!
!
connected-prefix-sid-map
  address-family ipv4
   2.2.2.2/32 index 1 range 1
  exit-address-family
!

l2vpn evpn instance 1 point-to-point
vpws context 1
  service target 1 source 1
  member GigabitEthernet0/0/6 service-instance 1
!
l2vpn evpn instance 2 point-to-point
route-target export 100:100
route-target import 100:100
vpws context 2
  service target 2 source 2
  member GigabitEthernet0/0/6 service-instance 2
!
l2vpn evpn instance 3 point-to-point
vpws context 3
  service target 3 source 3
  member GigabitEthernet0/0/6 service-instance 3
!

PE-1#show run | sec router bgp 1
router bgp 1
bgp log-neighbor-changes
neighbor 4.4.4.4 remote-as 1
neighbor 4.4.4.4 update-source Loopback0
!
address-family vpnv4
  neighbor 4.4.4.4 activate
  neighbor 4.4.4.4 send-community both
exit-address-family
!
address-family l2vpn evpn
  neighbor 4.4.4.4 activate
  neighbor 4.4.4.4 send-community both
exit-address-family
!
address-family ipv4 vrf RED
  redistribute ospf 2
exit-address-family
PE-1#
interface GigabitEthernet0/0/6
```

```
#CE facing interface
no ip address
media-type sfp
negotiation auto
no keepalive
service instance 1 ethernet
  encapsulation dot1q 1
!
service instance 2 ethernet
  encapsulation dot1q 2
!
service instance 3 ethernet
  encapsulation untagged
!
service instance 12 ethernet
  encapsulation dot1q 12
  rewrite ingress tag pop 1 symmetric
  bridge-domain 12
!
end

PE-1#show run int gigabitEthernet 0/0/8
Building configuration...

Current configuration : 156 bytes
!
interface GigabitEthernet0/0/8
#core facing interface
ip address 23.23.23.1 255.255.255.0
ip ospf 1 area 0
media-type sfp
negotiation auto
mpls ip
bfd template temp1
end
```

Example: EVPN-VPWS over SR, PE2 configurations:

```
show run int lo0
Building configuration...

Current configuration : 63 bytes
!
interface Loopback0
ip address 4.4.4.4 255.255.255.255
end

PE-2#show run | sec router ospf 1
router ospf 1
router-id 4.4.4.4
segment-routing mpls
segment-routing prefix-sid-map advertise-local
network 4.4.4.4 0.0.0.0 area 0
network 34.34.34.0 0.0.0.255 area 0
bfd all-interfaces
PE-2#show run | sec segment-r
segment-routing mpls
!
set-attributes
  address-family ipv4
   sr-label-preferred
  exit-address-family
```

```
!
!
connected-prefix-sid-map
  address-family ipv4
   4.4.4.4/32 index 1 range 1
  exit-address-family
!
PE-2#show run | sec l2vpn evpn
address-family l2vpn evpn
  neighbor 2.2.2.2 activate
  neighbor 2.2.2.2 send-community both
l2vpn evpn instance 1 point-to-point
vpws context 1
  service target 1 source 1
  member GigabitEthernet0/5/3 service-instance 1
!
l2vpn evpn instance 2 point-to-point
vpws context 2
  service target 2 source 2
  member GigabitEthernet0/5/3 service-instance 2
!
l2vpn evpn instance 3 point-to-point
vpws context 3
  service target 3 source 3
  member GigabitEthernet0/5/3 service-instance 3
!
PE-2# show run | sec router bgp 1
router bgp 1
bgp log-neighbor-changes
neighbor 2.2.2.2 remote-as 1
neighbor 2.2.2.2 update-source Loopback0
!
address-family ipv4
  neighbor 2.2.2.2 activate
  neighbor 2.2.2.2 send-community both
exit-address-family
!
address-family vpnv4
  neighbor 2.2.2.2 activate
  neighbor 2.2.2.2 send-community both
exit-address-family
!
address-family l2vpn evpn
  neighbor 2.2.2.2 activate
  neighbor 2.2.2.2 send-community both
exit-address-family
!
address-family ipv4 vrf RED
  redistribute ospf 2
exit-address-family
PE-2#

PE-2#show run int gigabitEthernet 0/5/3
Building configuration...

Current configuration : 369 bytes
!
interface GigabitEthernet0/5/3
#access facing interface
no ip address
negotiation auto
no keepalive
service instance 1 ethernet
  encapsulation dot1q 1
```

```
!
service instance 2 ethernet
  encapsulation dot1q 2
!
service instance 3 ethernet
  encapsulation untagged
!
service instance 45 ethernet
  encapsulation dot1q 45
  rewrite ingress tag pop 1 symmetric
  bridge-domain 45
!
end

PE-2#show run int gigabitEthernet 0/5/6
Building configuration...

Current configuration : 140 bytes
!
interface GigabitEthernet0/5/6
#core facing interface
ip address 34.34.34.2 255.255.255.0
ip ospf 1 area 0
negotiation auto
mpls ip
bfd template temp1
end
```

Additional References for EVPN-VPWS

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases

Standards and RFCs

Standard/RFC	Title
RFC 7432	*BGP MPLS-Based Ethernet VPN*
Standard	*VPWS support in EVPN*

MIBs

MIB	MIBs Link
•	—

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html