EVPN Virtual Private Wire Service (VPWS)

The EVPN-VPWS is a BGP control plane solution for point-to-point services. It implements the signaling and encapsulation techniques for establishing an EVPN instance between a pair of PEs. It has the ability to forward traffic from one network to another without MAC lookup. The use of EVPN for VPWS eliminates the need for signaling single-segment and multi-segment PWs for point-to-point Ethernet services. The EVPN-VPWS technology works on IP and MPLS core; IP core to support BGP and MPLS core for switching packets between the endpoints.

EVPN-VPWS support both single-homing and multi-homing.

Note When both MPLS and SRv6 are configured in the core, EVPN VPWS services cannot co-exist with SRv6 and MPLS.

Table 1: Feature History Table

Feature Name	Release Information	Feature Description
EVPN VPWS	Release 7.3.1	This feature is now supported on Cisco NCS 5700 series fixed port routers and the Cisco NCS 5500 series routers that have the Cisco NC57 line cards installed and operating in the native and compatible modes.

- Supported Modes for EVPN-VPWS, on page 1
- EVPN-VPWS Single Homed, on page 3
- EVPN-VPWS Multi-Homed, on page 5
- Flow Label Support for EVPN VPWS, on page 10
- CFM on EVPN VPWS, on page 13
- Y.1731 Support for EVPN-VPWS, on page 15

Supported Modes for EVPN-VPWS

EVPN-VPWS supports the following modes:

- Single-homed - Enables you to connect a customer edge (CE) device to one provider edge (PE) device.

- Multi-homed - Enables you to connect a customer edge (CE) device to more than one provider edge (PE) device. Multihoming ensures redundant connectivity. The redundant PE device ensures that there is no traffic disruption when there is a network failure. Following are the types of multihoming:
  - Single-Active - In single-active mode only a single PE among a group of PEs attached to the particular Ethernet-Segment is allowed to forward traffic to and from that Ethernet Segment.
  - All-Active - In all-active mode all the PEs attached to the particular Ethernet-Segment is allowed to forward traffic to and from that Ethernet Segment.

Benefits of EVPN-VPWS

The following are the benefits of EVPN-VPWS:

- Scalability is achieved without signaling pseudowires.
- Ease of provisioning
- Pseudowires (PWs) are not used.
- Leverages BGP best path selection (optimal forwarding).

Prerequisites for EVPN-VPWS

- Ensure BGP is configured for EVPN SAFI.
- BGP session between PEs with 'address-family l2vpn evpn' to exchange EVPN routes.

Restrictions for EVPN-VPWS

- The VPN ID is unique per router.
- When specifying a list of route targets, they must be unique per PE (per BGP address-family).
- On versions earlier than IOS XR release 6.7.1, MTU is not signaled and the MTU mismatch is ignored with no interoperability issues.
- On versions starting from IOS XR release 6.7.1, L3 MTU is advertised by default and the MTU mismatch is enforced by default.
- On versions earlier than IOS XR release 7.0.x, MTU is not signaled and the MTU mismatch is ignored with no interoperability issues.

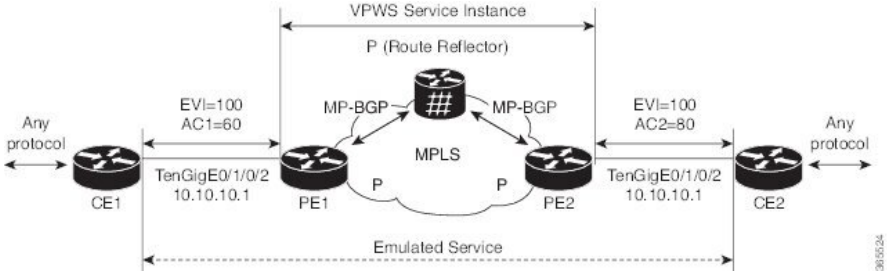
  On versions later than IOS XR release 7.0.x, L3 MTU is advertised by default and the MTU mismatch is enforced by default. But this results in interoperability issues with IOS XR release 7.3.2, if transmit-l2-mtu is configured since L3 and L2 MTUs do not match. You can configure **transmit-mtu-zero** and **ignore-mtu-mismatch** commands to avoid this situation.

  On versions later than IOS XR release 7.3.2, MTU of 0 is advertised by default, and the MTU mismatch is ignored by default. L2 MTU can be advertised using the **transmit-l2-mtu** command, and MTU mismatch can be enforced with **enforce-mtu-mismatch** command.

EVPN-VPWS Single Homed

The EVPN-VPWS single homed solution requires per EVI Ethernet Auto Discovery route. EVPN defines a new BGP Network Layer Reachability Information (NLRI) used to carry all EVPN routes. BGP Capabilities Advertisement 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 configuration:



- The VPWS service on PE1 requires the following three elements to be specified at configuration time:
  - The VPN ID (EVI)
  - The local AC identifier (AC1) that identifies the local end of the emulated service.
  - The remote AC identifier (AC2) that identifies the remote end of the emulated service.

  PE1 allocates a MPLS label per local AC for reachability.
- The VPWS service on PE2 is set in the same manner as PE1. The three same elements are required and the service configuration must be symmetric.

  PE2 allocates a MPLS label per local AC for reachability.
- PE1 advertise a single EVPN per EVI Ethernet AD route for each local endpoint (AC) to remote PEs with the associated MPLS label.

  PE2 performs the same task.
- On reception of EVPN per EVI EAD route from PE2, PE1 adds the entry to its local L2 RIB. PE1 knows the path list to reach AC2, for example, next hop is PE2 IP address and MPLS label for AC2.

  PE2 performs the same task.

Configure EVPN-VPWS Single Homed

This section describes how you can configure single-homed EVPN-VPWS feature.

```
/* Configure PE1 */

Router# configure
Router(config)# router bgp 100
Router(config-bgp)# address-family l2vpn evpn
Router(config-bgp-af)# exit
Router(config-bgp)# neighbor 10.10.10.1
Router(config-bgp-nbr))# address-family l2vpn evpn
```

```
Router(config-bgp-nbr-af)# commit
Router(config-bgp-nbr-af)# exit
Router(config-bgp-nbr)# exit
Router(config-bgp)# exit
Router(config)# l2vpn
Router(config-l2vpn)# xconnect group evpn-vpws
Router(config-l2vpn-xc)# p2p evpn1
Router(config-l2vpn-xc-p2p)# interface TenGigE0/1/0/2
Router(config-l2vpn-xc-p2p)# neighbor evpn evi 100 target 12 source 10
Router(config-l2vpn-xc-p2p)# commit

Router(config-l2vpn-xc-p2p)# exit
```

```
/* Configure PE2 */

Router# configure
Router(config)# router bgp 100
Router(config-bgp)# address-family l2vpn evpn
Router(config-bgp-af)# exit
Router(config-bgp)# neighbor 10.10.10.1
Router(config-bgp-nbr))# address-family l2vpn evpn
Router(config-bgp-nbr-af)# commit
Router(config-bgp-nbr-af)# exit
Router(config-bgp-nbr)# exit
Router(config-bgp)# exit
Router(config)# l2vpn
Router(config-l2vpn)# xconnect group evpn-vpws
Router(config-l2vpn-xc)# p2p evpn1
Router(config-l2vpn-xc-p2p)# interface TenGigE0/1/0/2
Router(config-l2vpn-xc-p2p)# neighbor evpn evi 100 target 10 source 12
Router(config-l2vpn-xc-p2p)# commit

Router(config-l2vpn-xc-p2p)# exit
```

Running Configuration

```
/* On PE1 */

configure
router bgp 100
 address-family l2vpn evpn
 neighbor 10.10.10.1
  address-family l2vpn evpn
!

configure
l2vpn
 xconnect group evpn-vpws
  p2p evpn1
   interface TenGigE0/1/0/2
   neighbor evpn evi 100 target 12 source 10
!
```

```
/* On PE2 */

configure
router bgp 100
 address-family l2vpn evpn
 neighbor 10.10.10.1
  address-family l2vpn evpn
!

configure
```

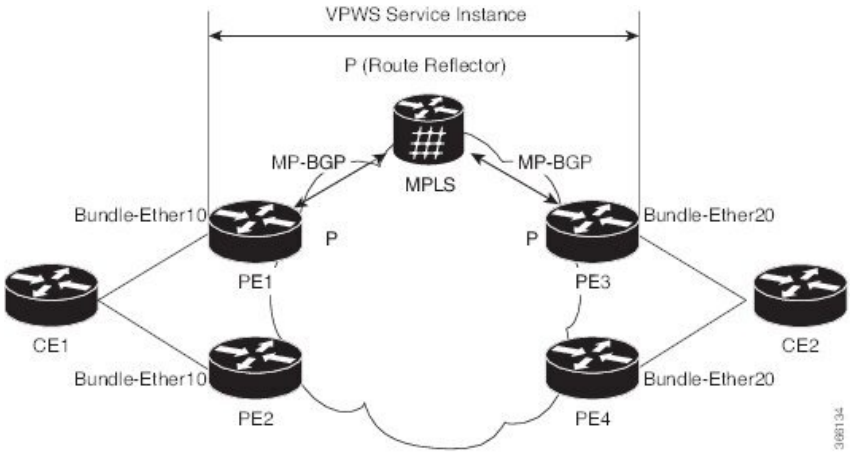
```
l2vpn
 xconnect group evpn-vpws
  p2p evpn1
   interface TenGigE0/1/0/2
   neighbor evpn evi 100 target 10 source 12
!
```

EVPN-VPWS Multi-Homed

The EVPN VPWS feature supports all-active multihoming capability that enables you to connect a customer edge device to two or more provider edge (PE) devices to provide load balancing and redundant connectivity. The load balancing is done using equal-cost multipath (ECMP).

When a CE device is multi-homed to two or more PEs and when all PEs can forward traffic to and from the multi-homed device for the VLAN, then such multihoming is referred to as all-active multihoming.

Figure 1: EVPN VPWS Multi-Homed



Consider the topology in which CE1 is multi-homed to PE1 and PE2; CE2 is multi-homed to PE3 and PE4. PE1 and PE2 will advertise an EAD per EVI route per AC to remote PEs which is PE3 and PE4, with the associated MPLS label. The ES-EAD route is advertised per ES (main interface), and it will not have a label. Similarly, PE3 and PE4 advertise an EAD per EVI route per AC to remote PEs, which is PE1 and PE2, with the associated MPLS label.

Consider a traffic flow from CE1 to CE2. Traffic is sent to either PE1 or PE2. The selection of path is dependent on the CE implementation for forwarding over a LAG. Traffic is encapsulated at each PE and forwarded to the remote PEs (PE 3 and PE4) through MPLS core. Selection of the destination PE is established by flow-based load balancing. PE3 and PE4 send the traffic to CE2. The selection of path from PE3 or PE4 to CE2 is established by flow-based load balancing.

If there is a failure and when the link from CE1 to PE1 goes down, the PE1 withdraws the ES-EAD route; sends a signal to the remote PEs to switch all the VPWS service instances associated with this multi-homed ES to backup PE, which is PE2.

Configure EVPN-VPWS Single-Active Multi-Homed

This section describes how to configure single-active multi-homed EVPN-VPWS feature. You can enable the single-active mode by using the **load-balancing-mode single-active** command.

```
/* Configure PE1 */
Router# configure
Router(config)# l2vpn
Router(config-l2vpn)#  xconnect group evpn_vpws
Router(config-l2vpn-xc)#  p2p e1_5-6
Router(config-l2vpn-xc-p2p)#  interface Bundle-Ether10.2
Router(config-l2vpn-xc-p2p)#  neighbor evpn evi 1 target 5 source 6
Router(config-l2vpn-xc-p2p)# exit

Router(config-l2vpn-xc)# exit
Router(config-l2vpn)# exit
Router(config)# evpn
Router(config-evpn)# interface Bundle-Ether10
Router(config-evpn-ac)#  ethernet-segment
Router(config-evpn-ac-es)# identifier type 0 00.01.00.ac.ce.55.00.0a.00
Router(config-evpn-ac-es)# load-balancing-mode single-active
Router(config-evpn-ac-es)# commit


/* Configure PE2 */
Router# configure
Router(config)# l2vpn
Router(config-l2vpn)#  xconnect group evpn_vpws
Router(config-l2vpn-xc)#  p2p e1_5-6
Router(config-l2vpn-xc-p2p)#  interface Bundle-Ether10.2
Router(config-l2vpn-xc-p2p)#  neighbor evpn evi 1 target 5 source 6
Router(config-l2vpn-xc-p2p)# exit

Router(config-l2vpn-xc)# exit
Router(config-l2vpn)# exit
Router(config)# evpn
Router(config-evpn)# interface Bundle-Ether10
Router(config-evpn-ac)#  ethernet-segment
Router(config-evpn-ac-es)# identifier type 0 00.01.00.ac.ce.55.00.0a.00
Router(config-evpn-ac-es)# load-balancing-mode single-active
Router(config-evpn-ac-es)# commit


/* Configure PE3 */
Router# configure
Router(config)# l2vpn
Router(config-l2vpn)#  xconnect group evpn_vpws
Router(config-l2vpn-xc)#  p2p e1_5-6
Router(config-l2vpn-xc-p2p)#  interface Bundle-Ether20.1
Router(config-l2vpn-xc-p2p)#  neighbor evpn evi 1 target 6 source 5
Router(config-l2vpn-xc-p2p)# exit

Router(config-l2vpn-xc)# exit
Router(config-l2vpn)# exit
Router(config)# evpn
Router(config-evpn)# interface Bundle-Ether20
Router(config-evpn-ac)#  ethernet-segment
Router(config-evpn-ac-es)# identifier type 0 00.01.00.ac.ce.55.00.14.00
Router(config-evpn-ac-es)# load-balancing-mode single-active
Router(config-evpn-ac-es)# commit


/* Configure PE4 */
Router# configure
Router(config)# l2vpn
Router(config-l2vpn)#  xconnect group evpn_vpws
Router(config-l2vpn-xc)#  p2p e1_5-6
Router(config-l2vpn-xc-p2p)#  interface Bundle-Ether20.1
```

```
Router(config-l2vpn-xc-p2p)#  neighbor evpn evi 1 target 6 source 5
Router(config-l2vpn-xc-p2p)# exit
Router(config-l2vpn-xc)# exit
Router(config-l2vpn)# exit
Router(config)# evpn
Router(config-evpn)# interface Bundle-Ether20
Router(config-evpn-ac)#  ethernet-segment
Router(config-evpn-ac-es)# identifier type 0 00.01.00.ac.ce.55.00.14.00
Router(config-evpn-ac-es)# load-balancing-mode single-active
Router(config-evpn-ac-es)# commit
```

Running Configuration

```
/* On PE1 */
!
configure
l2vpn xconnect group evpn_vpws
 p2p e1_5-6
  interface Bundle-Ether10.2
  neighbor evpn evi 1 target 5 source 6
!
evpn
interface Bundle-Ether10
  ethernet-segment
   identifier type 0 00.01.00.ac.ce.55.00.0a.00
   load-balancing-mode single-active
!


/* On PE2 */
!
configure
l2vpn xconnect group evpn_vpws
 p2p e1_5-6
  interface Bundle-Ether10.2
  neighbor evpn evi 1 target 5 source 6
!
evpn
interface Bundle-Ether10
  ethernet-segment
   identifier type 0 00.01.00.ac.ce.55.00.0a.00
   load-balancing-mode single-active
!

/* On PE3 */
!
configure
l2vpn xconnect group evpn_vpws
 p2p e1_5-6
  interface Bundle-Ether20.1
  neighbor evpn evi 1 target 6 source 5
!
evpn
interface Bundle-Ether20
  ethernet-segment
      identifier type 0 00.01.00.ac.ce.55.00.14.00
      load-balancing-mode single-active
!

/* On PE4 */
!
configure
l2vpn xconnect group evpn_vpws
```

```
 p2p e1_5-6
  interface Bundle-Ether20.1
  neighbor evpn evi 1 target 6 source 5
!
evpn
interface Bundle-Ether20
  ethernet-segment
      identifier type 0 00.01.00.ac.ce.55.00.14.00
      load-balancing-mode single-active
!
```

Configure EVPN-VPWS All-Active Multi-Homed

This section describes how to configure all-active multi-homed EVPN-VPWS feature.

```
/* Configure PE1 */
Router# configure
Router(config)# l2vpn
Router(config-l2vpn)#  xconnect group evpn_vpws
Router(config-l2vpn-xc)#  p2p e1_5-6
Router(config-l2vpn-xc-p2p)#  interface Bundle-Ether10.2
Router(config-l2vpn-xc-p2p)#  neighbor evpn evi 1 target 5 source 6
Router(config-l2vpn-xc-p2p)# exit

Router(config-l2vpn-xc)# exit
Router(config-l2vpn)# exit
Router(config)# evpn
Router(config-evpn)# interface Bundle-Ether10
Router(config-evpn-ac)#  ethernet-segment
Router(config-evpn-ac-es)# identifier type 0 00.01.00.ac.ce.55.00.0a.00
Router(config-evpn-ac-es)# commit


/* Configure PE2 */
Router# configure
Router(config)# l2vpn
Router(config-l2vpn)#  xconnect group evpn_vpws
Router(config-l2vpn-xc)#  p2p e1_5-6
Router(config-l2vpn-xc-p2p)#  interface Bundle-Ether10.2
Router(config-l2vpn-xc-p2p)#  neighbor evpn evi 1 target 5 source 6
Router(config-l2vpn-xc-p2p)# exit

Router(config-l2vpn-xc)# exit
Router(config-l2vpn)# exit
Router(config)# evpn
Router(config-evpn)# interface Bundle-Ether10
Router(config-evpn-ac)#  ethernet-segment
Router(config-evpn-ac-es)# identifier type 0 00.01.00.ac.ce.55.00.0a.00
Router(config-evpn-ac-es)# commit


/* Configure PE3 */
Router# configure
Router(config)# l2vpn
Router(config-l2vpn)#  xconnect group evpn_vpws
Router(config-l2vpn-xc)#  p2p e1_5-6
Router(config-l2vpn-xc-p2p)#  interface Bundle-Ether20.1
Router(config-l2vpn-xc-p2p)#  neighbor evpn evi 1 target 6 source 5
Router(config-l2vpn-xc-p2p)# exit
```

```
Router(config-l2vpn-xc)# exit
Router(config-l2vpn)# exit
Router(config)# evpn
Router(config-evpn)# interface Bundle-Ether20
Router(config-evpn-ac)#  ethernet-segment
Router(config-evpn-ac-es)# identifier type 0 00.01.00.ac.ce.55.00.14.00
Router(config-evpn-ac-es)# commit


/* Configure PE4 */
Router# configure
Router(config)# l2vpn
Router(config-l2vpn)#  xconnect group evpn_vpws
Router(config-l2vpn-xc)#  p2p e1_5-6
Router(config-l2vpn-xc-p2p)#  interface Bundle-Ether20.1
Router(config-l2vpn-xc-p2p)#  neighbor evpn evi 1 target 6 source 5
Router(config-l2vpn-xc-p2p)# exit
Router(config-l2vpn-xc)# exit
Router(config-l2vpn)# exit
Router(config)# evpn
Router(config-evpn)# interface Bundle-Ether20
Router(config-evpn-ac)#  ethernet-segment
Router(config-evpn-ac-es)# identifier type 0 00.01.00.ac.ce.55.00.14.00
Router(config-evpn-ac-es)# commit
```

Running Configuration

```
/* On PE1 */
!
configure
l2vpn xconnect group evpn_vpws
 p2p e1_5-6
  interface Bundle-Ether10.2
  neighbor evpn evi 1 target 5 source 6
!
evpn
interface Bundle-Ether10
  ethernet-segment
   identifier type 0 00.01.00.ac.ce.55.00.0a.00

!


/* On PE2 */
!
configure
l2vpn xconnect group evpn_vpws
 p2p e1_5-6
  interface Bundle-Ether10.2
  neighbor evpn evi 1 target 5 source 6
!
evpn
interface Bundle-Ether10
  ethernet-segment
   identifier type 0 00.01.00.ac.ce.55.00.0a.00

!

/* On PE3 */
!
configure
l2vpn xconnect group evpn_vpws
```

```
 p2p e1_5-6
  interface Bundle-Ether20.1
  neighbor evpn evi 1 target 6 source 5
!
evpn
interface Bundle-Ether20
  ethernet-segment
      identifier type 0 00.01.00.ac.ce.55.00.14.00

!

/* On PE4 */
!
configure
l2vpn xconnect group evpn_vpws
 p2p e1_5-6
  interface Bundle-Ether20.1
  neighbor evpn evi 1 target 6 source 5
!
evpn
interface Bundle-Ether20
  ethernet-segment
      identifier type 0 00.01.00.ac.ce.55.00.14.00

!
```

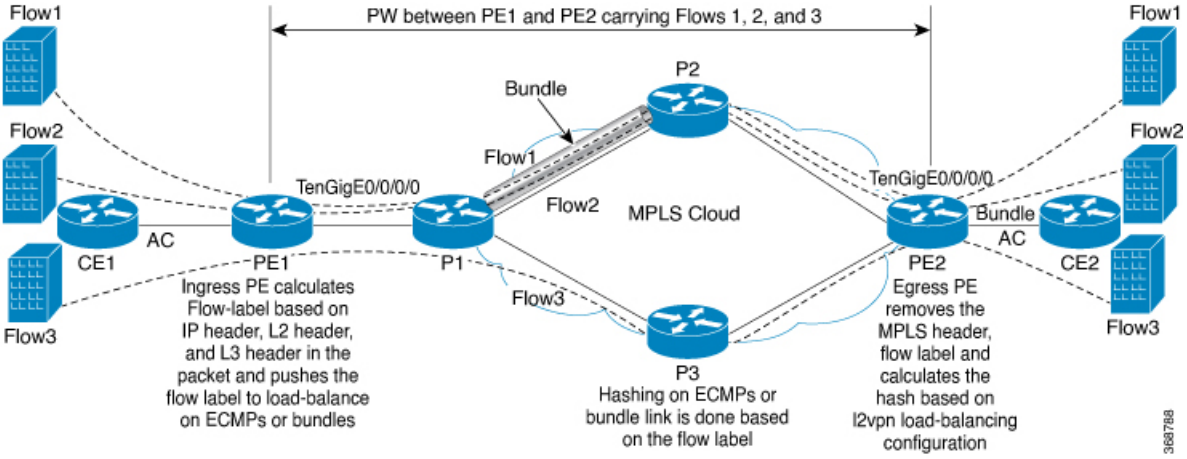
Flow Label Support for EVPN VPWS

The Flow Label support for EVPN VPWS feature enables provider (P) routers to use the flow-based load balancing to forward traffic between the provider edge (PE) devices. This feature uses Flow-Aware Transport (FAT) of pseudowires (PW) over an MPLS packet switched network for load-balancing traffic across BGP-based signaled pseudowires for Ethernet VPN (EVPN) Virtual Private Wire Service (VPWS).

FAT PWs provide the capability to identify individual flows within a PW and provide routers the ability to use these flows to load-balance the traffic. FAT PWs are used to load balance the traffic in the core when equal cost multipaths (ECMP) are used. A flow label is created based on indivisible packet flows entering an imposition PE. This flow label is inserted as the lower most label in the packet. P routers use the flow label for load balancing to provide better traffic distribution across ECMP paths or link-bundled paths in the core. A flow is identified either by the source and destination IP address of the traffic, or the source and destination MAC address of the traffic.

The following figure shows a FAT PW with two flows distributing over ECMPs and bundle links.

Figure 2: FAT PW with Two Flows Distributing over ECMPs and Bundle



An extra label is added to the stack, called the flow label, which is generated for each unique incoming flow on the PE. A flow label is a unique identifier that distinguishes a flow within the PW, and is derived from source and destination MAC addresses, and source and destination IP addresses. The flow label contains the end of label stack (EOS) bit set. The flow label is inserted after the VC label and before the control word (if any). The ingress PE calculates and forwards the flow label. The FAT PW configuration enables the flow label. The egress PE discards the flow label such that no decisions are made.

Core routers perform load balancing using the flow-label in the FAT PW with other information like MAC address and IP address. The flow-label adds greater entropy to improve traffic load balancing. Therefore, it is possible to distribute flows over ECMPs and link bundles.

In this topology, the imposition router, PE1, adds a flow label in the traffic. The disposition router, PE2, allows mixed types of traffic of which some have flow label, others do not. The P router uses flow label to load balance the traffic between the PEs. PE2 ignores the flow label in traffic, and uses one EVPN label for all unicast traffic.

Restrictions

To configure flow label for EVPN VPWS, the following restrictions are applicable:

- This feature is not supported for EVPN Point-to-Multipoint (P2MP) of VPLS and Ethernet LAN (E-LAN) service.
- This feature is supported only for EVPN VPWS single homing. AC bundle interfaces must be configured with ESI-0 only.
- This feature is not supported for EVPN flexible cross-connect service.
- This feature is not supported for EVPN VPWS multihoming.

Configure Flow Label for EVPN VPWS

Configuration Example

Perform this task to configure flow label for EVPN VPWS on both PE1 and PE2.

```
Router# configure
Router(config)# l2vpn
Router(config-l2vpn)# xconnect group evpn-vpws
Router(config-l2vpn-xc)# p2p evpn1
Router(config-l2vpn-xc-p2p)# interface TenGigE0/0/0/0
Router(config-l2vpn-xc-p2p)# neighbor evpn evi 1 target 2 source 1
Router(config-l2vpn-xc-p2p)# exit
!
Router# configure
Router(config)# evpn
Router(config-evpn)# evi 1

Router(config-evpn-instance)# load-balancing
Router(config-evpn-instance-lb)# flow-label static
Router(config-evpn-instance-lb)# commit
```

Running Configuration

This section shows the running configuration of flow label for EVPN VPWS.

```
l2vpn
 xconnect group evpn-vpws
  p2p evpn1
   interface TenGigE0/0/0/0
   neighbor evpn evi 1 target 2 source 1
   !
  !
evpn
 evi 1
    load-balancing
   flow-label static
  !
!
```

Verification

Verify EVPN VPWS flow label configuration.

```
Router# show l2vpn xconnect detail
Group evpn-vpws, XC evpn1, state is up; Interworking none
  AC: TenGigE0/0/0/0, state is up
    Type Ethernet
    MTU 1500; XC ID 0x1; interworking none
    Statistics:
      packets: received 21757444, sent 0
      bytes: received 18226521128, sent 0
  EVPN: neighbor 100.100.100.2, PW ID: evi 1, ac-id 2, state is up ( established )
    XC ID 0xc0000001
    Encapsulation MPLS
   Encap type Ethernet, control word disabled
    Sequencing not set
    LSP : Up
    Flow Label flags configured (Tx=1,Rx=1) statically

      EVPN         Local                          Remote
      ------------ ------------------------------ ------------------------------
      Label        64002                          64002
      MTU          1500                           1500
      Control word disabled                       disabled
      AC ID        1                              2
```

```
  EVPN type    Ethernet                       Ethernet

  ------------ ------------------------------ ------------------------------
Create time: 30/10/2018 03:04:16 (00:00:40 ago)
Last time status changed: 30/10/2018 03:04:16 (00:00:40 ago)
Statistics:
  packets: received 0, sent 21757444
  bytes: received 0, sent 18226521128
```

Related Topics

- Flow Label Support for EVPN VPWS, on page 10

Associated Commands

- show evpn evi

CFM on EVPN VPWS

Table 2: Feature History Table

Feature Name	Release Information	Feature Description
CFM on EVPN VPWS	Release 7.4.1	This feature allows you to effectively manage a network with EVPN services running EVPN VPWS. The CFM provides proactive network management, troubleshooting, connectivity monitoring, fault verification, and fault isolation. This feature is supported only on EVPN single homing mode with only one AC on the bridge domain. This feature is now supported on routers that have Cisco NC57 line cards installed and operate in native mode only.

Connectivity fault management (CFM) is a service-level Operations and Maintenance (OAM) protocol that provides tools for monitoring and troubleshooting end-to-end Ethernet services. This feature provides high speed Layer 2 and Layer 3 services with high resiliency and less operational complexity to different market segments.

Supported Offload Types and Timer Values

The following are supported offload types:

- Hardware (HW) Offload: The continuity check message (CCM) timers for a CFM session on a physical interface is less than 100 ms.
- Non-Offload: The CCM timers for a CFM session on a physical interface is greater than 100 ms.
- Software (SW) Offload: The CFM session on a bundle interface.

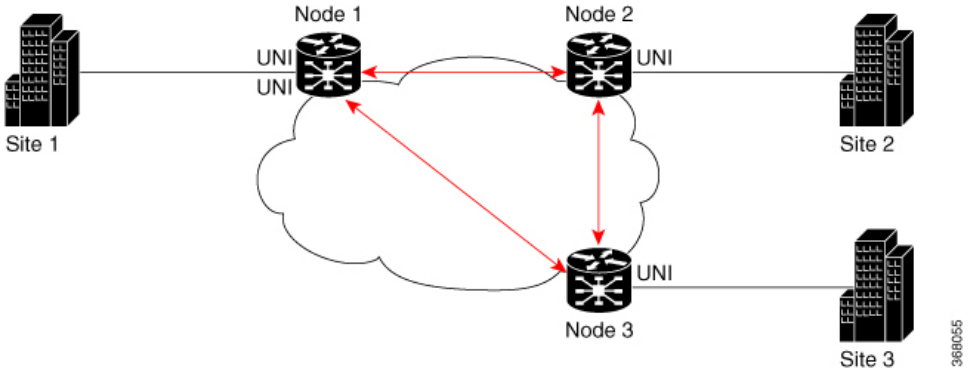
The following are the supported offload timer values:

- 3.3ms: Interval of 3.3 milliseconds
- 10ms: Interval of 10 milliseconds

- 100ms: Interval of 100 milliseconds
- 1s: Interval of 1 second
- 10s: Interval of 10 seconds
- 1m: Interval of 1 minute
- 10m: Interval of 10 minutes

Configure CFM on EVPN VPWS

Figure 3: CFM on EVPN VPWS: Full Mesh Topology



Node 1, 2 and 3 in this topology can be Cisco routers.

Configuring CFM on EVPN VPWS involves these main tasks:

- Enabling CFM service continuity check
- Configuring MEP cross-check
- Enabling CFM for the interface

Configuration Example

```
/* Enabling CFM continuity check */
Router# ethernet cfm
Router(config-cfm# domain xcup1 level 7 id null
Router(config-cfm-dmn)# service xcup1 xconnect group evpn_vpws_Bundle_ether203 p2p
evpn_vpws-100 id number 4001
Router(config-cfm-dmn-svc)# mip auto-create all ccm-learning
Router(config-cfm-dmn-svc)# continuity-check interval 1s
/* Configuring MEP cross-check */
Router(config-cfm-dmn-svc)# mep crosscheck
Router(config-cfm-dmn-svc)# mep-id 4001
Router(config-cfm-dmn-svc)# commit
```

Repeat the above configurations for node 2 and node 3, with the respective mep-id values. For node 2, configure MEP cross-check with respective mep-id values of node 1 and node 3 (2001 and 3001 respectively, in this example). For node 3, configure MEP cross-check with respective mep-id values of node 1 and node 2 (4001 and 2001 respectively, in this example).

```
/* Enabling CFM on the interface */
Router# configure
Router(config)# interface Bundle-Ether203.2001 l2transport
Router(config-subif)# encapsulation dot1q 2001
Router(config-subif)# ethernet cfm
Router(config-if-cfm)# mep domain xcup1 service xcup1 mep-id 2001
Router(config-if-cfm-mep)# commit
```

You must repeat the above configurations for node 2 and node 3, with the respective *mep-id* values.

Running Configuration

This sections shows the running configuration on node 1.

```
ethernet cfm
 domain xcup1 level 7 id null
  service xcup1 xconnect group evpn_vpws_Bundle_ether203 p2p evpn_vpws-100 id number 4001
   mip auto-create all ccm-learning
   continuity-check interval 1s
   mep crosscheck
    mep-id 4001
   !
  !
 !
!
interface Bundle-Ether203.2001 l2transport
 encapsulation dot1q 2001
 ethernet cfm
  mep domain xcup1 service xcup1 mep-id 2001
 !
```

Y.1731 Support for EVPN-VPWS

Table 3: Feature History Table

Feature Name	Release Information	Feature Description
Y.1731 Support for EVPN-VPWS	Release 7.5.1	EVPN VPWS services support CFM continuity check, ITU-T Y.1731 compliant Delay Measurement Message (DMM) and Synthetic Loss Measurement (SLM) functions. This feature is supported only on single-homed EVPN VPWS. This feature is now supported on routers that have Cisco NC57 line cards installed and operate in native mode.

DMM is used to periodically measure frame delay and frame delay variation between a pair of point-to-point Maintenance End Point (MEPs). Measurements are made between two MEPs belonging to the same domain and Maintenance Association (MA).

SLM is used to periodically measure Frame Loss and Forward Loss Ratio (FLR) between a pair of point to point MEPs. Measurements are made between two MEPs that belong to the same domain and MA.

Configuration Example

```
l2vpn
 xconnect group evpn_vpws_203
  p2p evpn_vpws_phy-100
   interface GigabitEthernet0/0/0/2.100
   neighbor evpn evi 30001 target 30001 source 50001
   !

ethernet cfm
 domain xcup1 level 7 id null
  service xcup1 xconnect group evpn_vpws_Bundle_ether203 p2p evpn_vpws-100 id number 4001
   mip auto-create all ccm-learning
   continuity-check interval 1s
   mep crosscheck
    mep-id 4001
!

interface GigabitEthernet0/0/0/2.100 l2transport
encapsulation dot1q 100
rewrite ingress tag pop 1 symmetric
mtu 9100
ethernet cfm
  mep domain bd-domain service bd-service mep-id 4001
   sla operation profile test-profile1 target mep-id 1112
!

ethernet sla
 profile EVC-1 type cfm-delay-measurement
  probe
   send packet every 1 seconds
  !
  schedule
   every 3 minutes for 120 seconds
  !
  statistics
   measure round-trip-delay
    buckets size 1 probes
    buckets archive 5
!
```