# Vista geral e exemplo de configuração comutados etiqueta do Multicast ASR 9000 VPL (LS)

## Índice



## Introdução

Este documento descreve o Multicast comutado do serviço da LAN privada (VPL) etiqueta virtual (LS) para o 9000 Series do roteador dos serviços da agregação (ASR) que executa o software do ® XR do Cisco IOS.

## Pré-requisitos

### Requisitos

Não existem requisitos específicos para este documento.

### Componentes Utilizados

Este documento não se restringe a versões de software e hardware específicas.

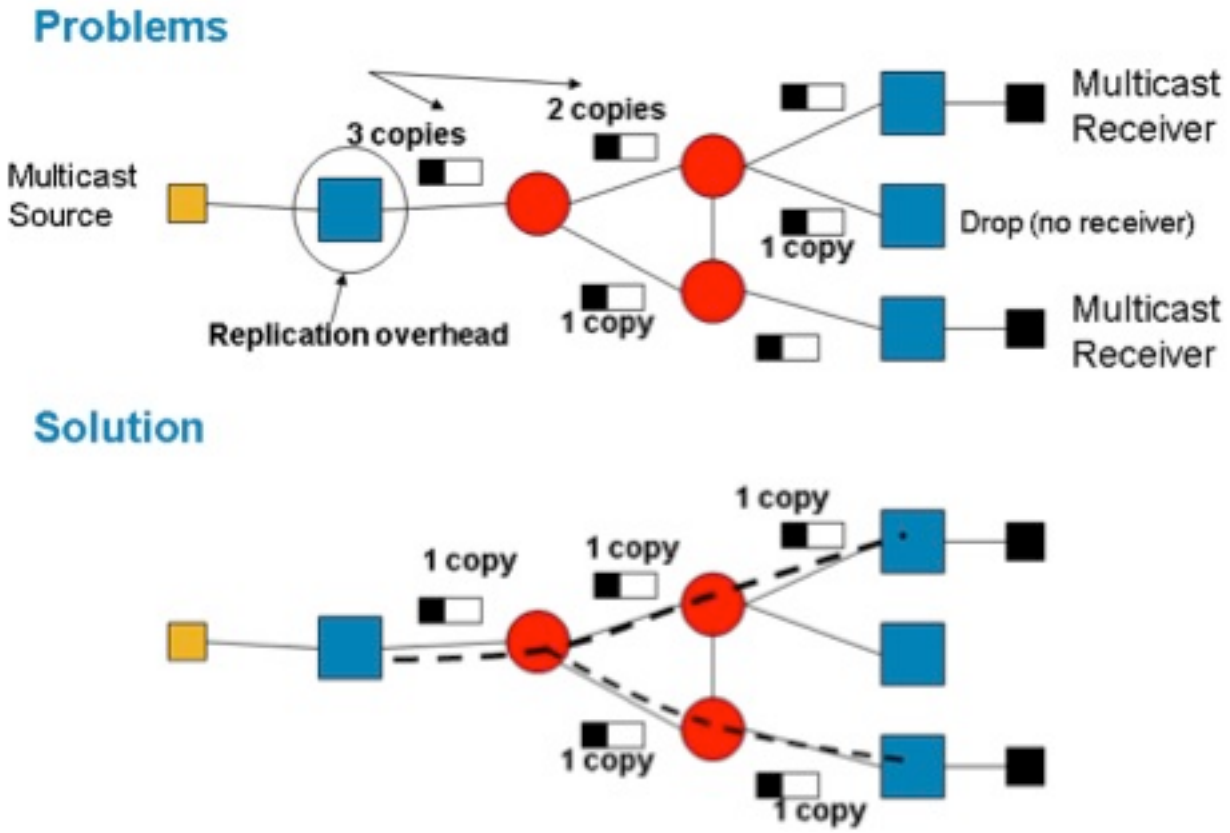
As informações neste documento foram criadas a partir de dispositivos em um ambiente de laboratório específico. Todos os dispositivos utilizados neste documento foram iniciados com uma configuração (padrão) inicial. Se a sua rede estiver ativa, certifique-se de que entende o impacto potencial de qualquer comando.

## Os VPL etiquetam a vista geral comutada do Multicast (LS)

Os VPL emulam serviços de LAN através de um núcleo do Multiprotocol Label Switching (MPLS). Uma malha cheia dos pseudowires (P2P) pontos a ponto (PWs) estabelece-se entre todo o Roteadores da ponta de provedor (PE) que participa em um domínio VPL a fim fornecer a emulation VPL. A transmissão, o Multicast, e o tráfego do unicast desconhecido são inundados em um domínio VPL a todos os PE. A replicação do ingresso é usada a fim enviar esse tráfego inundado sobre cada P2P PWs a todos os roteadores de PE remotos que são parte do mesmo domínio VPL.

### Inconvenientes da replicação do ingresso

- A replicação do ingresso é largura de banda incapaz porque o mesmo pacote pôde ser enviado épocas múltiplas sobre o mesmo link para cada P2P picowatt.
- A replicação do ingresso pode conduzir à largura de banda de enlace desperdiçada significativa quando há uma transmissão pesada e o Multicast VPL trafica.
- A replicação do ingresso é igualmente recursos intensivos porque o roteador de PE do ingresso carrega a carga completa da replicação.




## Características VPL LS

Os VPL são uma tecnologia largo-distribuída do provedor de serviços L2VPN que seja usada igualmente para o transporte do Multicast. Embora a tecnologia L2 permita que a espião seja usada a fim aperfeiçoar a replicação do tráfego multicast nos pseudowires L2, o núcleo permanece agnóstico ao tráfego multicast. Em consequência, as cópias múltiplas do mesmo fluxo atravessam redes central. A fim abrandar esta incapacidade, pares LS com VPL a fim introduzir árvores de transmissão múltiplas LS sobre o núcleo. No Software Cisco IOS XR libere 5.1.0, o implementar VPL LS do 9000 Series de Cisco ASR com as árvores inclusivas point-to-multipoint da engenharia de tráfego (P2MP-TE). Os pontos finais VPL são descobertos automaticamente e as árvores P2MP-TE estabelecem-se com o uso da engenharia de tráfego do protocolo de reserva de recursos (RSVP-TE) sem intervenção operacional.

- OS VPL LS superam os inconvenientes da replicação do ingresso.
- A solução VPL LS emprega P2MP LSP no núcleo MPLS a fim levar a transmissão, o Multicast, e o tráfego do unicast desconhecido para um domínio VPL.
- O P2MP LSP permite a replicação no nó ótimo da rede MPLS no máximo e minimiza a quantidade de replicação do pacote na rede.
- A solução VPL LS envia somente o tráfego inundado VPL sobre P2MP LSP.
- O tráfego do unicast VPL é enviado ainda sobre P2P PWs. O tráfego enviado sobre o acesso PWs continua a ser enviado com replicação do ingresso.
- O P2MP PWs é unidirecional ao contrário de P2P PWs, que são bidirecionais.

- A solução VPL LS envolve a criação de um P2MP picowatt pelo domínio VPL a fim emular um serviço VPL P2MP para o núcleo PWs no domínio VPL.

- OS VPL LS são apoiados na liberação 5.1.0 do Cisco IOS XR e mais atrasado.

### Limitações VPL LS

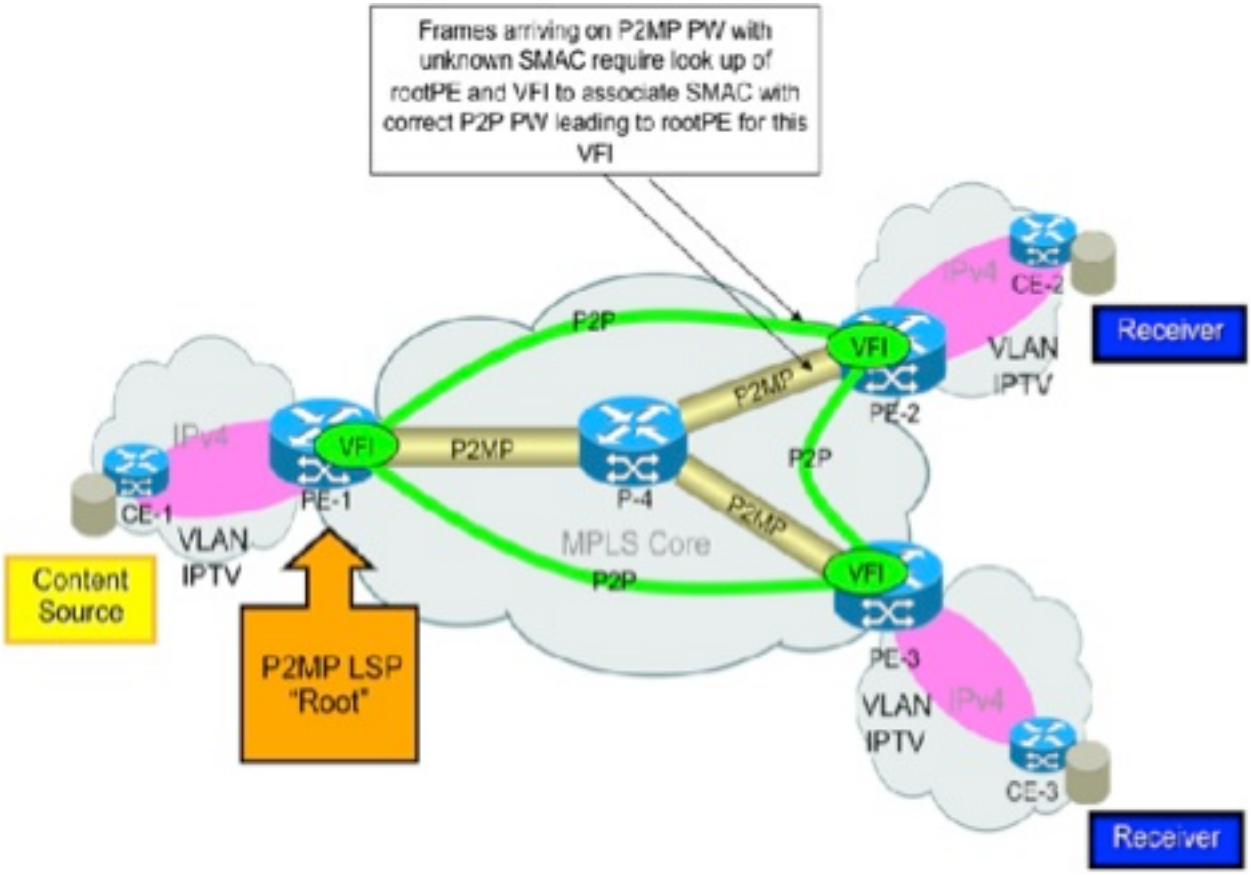
- A funcionalidade da liberação 5.1.0 VPL LS do Cisco IOS XR apoia somente as árvores da Engenharia de tráfego MPLS P2MP-TE estabelecidas com RSVP-TE.

- UM P2MP picowatt pode ser sinalizado com o protocolo BGP somente na liberação 5.1.0 do Cisco IOS XR. Nesta primeira fase, os PE remotos que participam no domínio VPL auto-são descobertos com descoberta automática BGP (BGP-AD).

- A sinalização estática LDP não é apoiada na liberação 5.1.0 do Cisco IOS XR.

## Aprendizagem do Media Access Control (MAC)

A aprendizagem MAC na folha PE para um quadro que chegue em P2MP picowatt é feita como se o quadro é recebido no P2P picowatt que conduz à raiz PE para esse P2MP picowatt. Nesta imagem, a aprendizagem MAC em PE-2 para os quadros que chegam no P2MP picowatt LSP enraizado no PE-1 é feita como se o quadro chegou no P2P picowatt entre o PE-1 e o PE-2. O plano do controle L2VPN é responsável para programar a informação da disposição VPL com informação P2P picowatt para a aprendizagem MAC na disposição P2MP LSP.



# Apoio da espião do protocolo de gestão do grupo do Internet (IGMPSN)

A verificação do Protocolo de Gerenciamento do Grupo da Internet (IGMP) (IGMPSN) é apoiada em ambos o começo e fim da P-árvore P2MP em um domínio de Bridge que participe em VPL LS. Isto permite que o tráfego multicast IGMPSN sobre um exemplo do forwarding virtual (VFI) PWs tire proveito da otimização do recurso fornecida por P2MP LSP. Se IGMPSN é permitido em um domínio de Bridge com uns ou vários VFI PWs que participa em VPL LS, todo o tráfego multicast da camada dois (L2) está enviado sobre a cabeça da P-árvore P2MP associada com o domínio de Bridge. As rotas de transmissão múltiplas L2 são usadas a fim enviar o tráfego aos receptores locais, Ethernet fluem os pontos (EFPs), o acesso PWs, e os VFI PWs que não participam em VPL LS.

Quando IGMPSN é permitido em um domínio de Bridge que seja uma cauda P2MP LSP, a disposição aperfeiçoada do tráfego multicast L2 recebida no P2MP LSP é feita para receptores locais (isto é, portas de Bridge do circuito do acessório (AC) (BP) e acesso picowatt BP).

> Nota: A espião do protocolo da distribuição de rótulo do Multicast (MLDP) não é apoiada na liberação 5.1.0 do Cisco IOS XR.

# Escala apoiada

A liberação 5.1.0 apoia um máximo de 1000 túneis P2MP ou 1000 P2MP PWs do Cisco IOS XR per capita/roteador do Tail.

# Configuração VPL LS

## Configuração de túnel do automóvel P2MP

```
mpls traffic-eng
 interface GigabitEthernet0/1/1/0
 !
 interface GigabitEthernet0/1/1/1
 !
 auto-tunnel p2mp
 tunnel-id min 100 max 200
```

## Configuração do Fast ReRoute do MPLS TE (FRR)

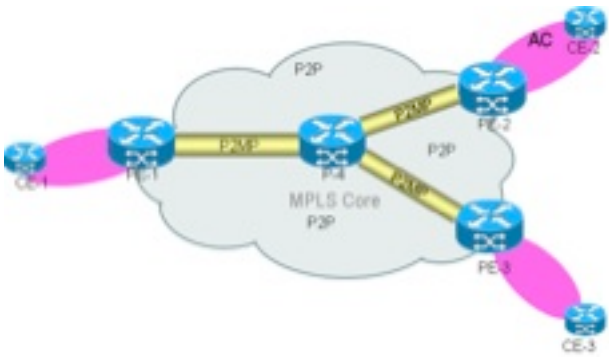
```
mpls traffic-eng
 interface GigabitEthernet0/1/1/0
 auto-tunnel backup
  nhop-only
 !
 !
 interface GigabitEthernet0/1/1/1
 auto-tunnel backup
  nhop-only
```

```
 !
 !
 auto-tunnel p2mp
 tunnel-id min 100 max 200
 !
 auto-tunnel backup
 tunnel-id min 1000 max 1500
 !
 attribute-set p2mp-te set1
 bandwidth 10000
 fast-reroute
 record-route
 !
```

### Configuração L2VPN

```
l2vpn
 bridge group bg1
 bridge-domain bg1_bd1
  interface GigabitEthernet0/1/1/10.1
  !
  vfi bg1_bd1_vfi
   vpn-id 1
   autodiscovery bgp
    rd auto
    route-target 209.165.201.1:1
    signaling-protocol bgp
     ve-id 100
    !
   !
   multicast p2mp
    signaling-protocol bgp
    !
    transport rsvp-te
     attribute-set p2mp-te set1
    !
```

## Exemplo de topologia e configuração




Os túneis P2MP são túneis auto-descobertos. Os túneis estáticos P2MP não são apoiados.

As configurações de túnel estáticas não são usadas. A auto configuração de túnel P2MP deve ser permitida em todos os roteadores de PE e igualmente em um roteador P se atua como um nó do botão. Um nó do botão é um roteador do ponto médio e da extremidade final ao mesmo tempo.

Um exemplo de topologia com configuração é mostrado aqui. Nesta topologia, o P2MP PWs é criado entre os três PE e um roteador P que atue como um nó do botão. Todos os três roteadores

de PE atuam como a cabeça (para o tráfego de ingresso) e o Tail (para o tráfego de saída).

## Configuração PE1

```
RP/0/RSP0/CPU0:PE1#show run
hostname PE1
!
ipv4 unnumbered mpls traffic-eng Loopback0
!
interface Loopback0
 ipv4 address 209.165.200.225 255.255.255.255
!
interface GigabitEthernet0/1/1/0
 description connected P router
 ipv4 address 209.165.201.1 255.255.255.224
!
interface GigabitEthernet0/1/1/1
 description connected to P router
 ipv4 address 209.165.201.151 255.255.255.224
 transceiver permit pid all
!
interface GigabitEthernet0/1/1/10
 transceiver permit pid all
!
interface GigabitEthernet0/1/1/10.1 l2transport
 encapsulation dot1q 1
!
router ospf 100
 router-id 209.165.200.225
 area 0
 mpls traffic-eng
 interface Loopback0
 !
 interface GigabitEthernet0/1/1/0
 !
 interface GigabitEthernet0/1/1/1
 !
 !
 mpls traffic-eng router-id 209.165.200.225
!
router bgp 100
 nsr
 bgp router-id 209.165.200.225
 bgp graceful-restart
 address-family l2vpn vpls-vpws
 !
 neighbor 209.165.200.226
 remote-as 100
 update-source Loopback0
 address-family l2vpn vpls-vpws
 !
 !
 neighbor 209.165.200.227
 remote-as 100
 update-source Loopback0
 address-family l2vpn vpls-vpws
 !
 !
 neighbor 209.165.200.228
 remote-as 100
 update-source Loopback0
```

```
 address-family l2vpn vpls-vpws
 !
 !
!
l2vpn
 bridge group bg1
 bridge-domain bg1_bd1
  interface GigabitEthernet0/1/1/10.1
  !
  vfi bg1_bd1_vfi
   vpn-id 1
   autodiscovery bgp
    rd auto
    route-target 209.165.201.1:1
    signaling-protocol bgp
     ve-id 100
    !
   !
   multicast p2mp
    signaling-protocol bgp
    !
    transport rsvp-te
     attribute-set p2mp-te set1
    !
   !
  !
 !
 !
!
rsvp
 interface GigabitEthernet0/1/1/0
 bandwidth 100000
 !
 interface GigabitEthernet0/1/1/1
 bandwidth 100000
 !
!
mpls traffic-eng
 interface GigabitEthernet0/1/1/0
 auto-tunnel backup
  nhop-only
 !
 !
 interface GigabitEthernet0/1/1/1
 auto-tunnel backup
  nhop-only
 !
 !
 auto-tunnel p2mp
 tunnel-id min 100 max 200
 !
 auto-tunnel backup
 tunnel-id min 1000 max 1500
 !
 attribute-set p2mp-te set1
 bandwidth 10000
 fast-reroute
 record-route
 !
!
mpls ldp
 nsr
 graceful-restart
 router-id 209.165.200.225
```

```
 interface GigabitEthernet0/1/1/0
 !
 interface GigabitEthernet0/1/1/1
 !
!
end

RP/0/RSP0/CPU0:PE1#
```

## Configuração P

```
RP/0/RSP0/CPU0:P#show run
hostname P
ipv4 unnumbered mpls traffic-eng Loopback0
interface Loopback0
 ipv4 address 209.165.200.226 255.255.255.255
!
interface GigabitEthernet0/1/1/0
 description connected to PE1 router
 ipv4 address 209.165.201.2 255.255.255.224
 transceiver permit pid all
!
interface GigabitEthernet0/1/1/1
 description connected to PE1 router
 ipv4 address 209.165.201.152 255.255.255.224
 transceiver permit pid all
!
interface GigabitEthernet0/1/1/3
 description connected to PE2 router
 ipv4 address 209.165.201.61 255.255.255.224
!
interface GigabitEthernet0/1/1/4
 transceiver permit pid all
!
interface GigabitEthernet0/1/1/4.1 l2transport
 encapsulation dot1q 1
!
interface GigabitEthernet0/1/1/8
 description connected to PE3 router
 ipv4 address 209.165.201.101 255.255.255.224
!
router ospf 100
 nsr
 nsf cisco
 area 0
 mpls traffic-eng
 interface Loopback0
 !
 interface GigabitEthernet0/1/1/0
 !
 interface GigabitEthernet0/1/1/1
 !
 interface GigabitEthernet0/1/1/3
 !
 interface GigabitEthernet0/1/1/8
 !
 !
 mpls traffic-eng router-id 209.165.200.226
!
router bgp 100
 nsr
 bgp router-id 209.165.200.226
 bgp graceful-restart
```

```
 address-family l2vpn vpls-vpws
 !
 neighbor 209.165.200.225
 remote-as 100
 update-source Loopback0
 address-family l2vpn vpls-vpws
 !
 !
 neighbor 209.165.200.227
 remote-as 100
 update-source Loopback0
 address-family l2vpn vpls-vpws
 !
 !
 neighbor 209.165.200.228
 remote-as 100
 update-source Loopback0
 address-family l2vpn vpls-vpws
 !
 !
!
l2vpn
 bridge group bg1
 bridge-domain bg1_bd1
  interface GigabitEthernet0/1/1/4.1
  !
  vfi bg1_bd1_vfi
   vpn-id 1
   autodiscovery bgp
    rd auto
    route-target 209.165.201.1:1
    signaling-protocol bgp
     ve-id 200
    !
   !
   multicast p2mp
    signaling-protocol bgp
    !
    transport rsvp-te
     attribute-set p2mp-te set1
    !
   !
  !
 !
 !
!
rsvp
 interface GigabitEthernet0/1/1/0
 bandwidth 100000
 !
 interface GigabitEthernet0/1/1/1
 bandwidth 100000
 !
 interface GigabitEthernet0/1/1/3
 bandwidth 100000
 !
 interface GigabitEthernet0/1/1/8
 bandwidth 100000
 !
!
mpls traffic-eng
 interface GigabitEthernet0/1/1/0
 auto-tunnel backup
  nhop-only
```

```
 !
 !
 interface GigabitEthernet0/1/1/1
 auto-tunnel backup
  nhop-only
 !
 !
 interface GigabitEthernet0/1/1/3
 !
 interface GigabitEthernet0/1/1/8
 !
 auto-tunnel p2mp
 tunnel-id min 100 max 200
 !
 auto-tunnel backup
 tunnel-id min 1000 max 1500
 !
 attribute-set p2mp-te set1
 bandwidth 10000
 fast-reroute
 record-route
 !
!
mpls ldp
 nsr
 graceful-restart
 router-id 209.165.200.226
 interface GigabitEthernet0/1/1/0
 !
 interface GigabitEthernet0/1/1/1
 !
 interface GigabitEthernet0/1/1/3
 !
 interface GigabitEthernet0/1/1/8
 !
!
end

RP/0/RSP0/CPU0:P#
```

## Configuração PE2

```
RP/0/RSP0/CPU0:PE2#show run
hostname PE2
ipv4 unnumbered mpls traffic-eng Loopback0
interface Loopback0
 ipv4 address 209.165.200.227 255.255.255.255
!
interface GigabitEthernet0/3/0/2.1 l2transport
 encapsulation dot1q 1
!
interface GigabitEthernet0/3/0/3
 description connected to P router
 ipv4 address 209.165.201.62 255.255.255.224
 transceiver permit pid all
!
router ospf 100
 nsr
 router-id 209.165.200.227
 nsf cisco
 area 0
 mpls traffic-eng
 interface Loopback0
```

```
 !
 interface GigabitEthernet0/3/0/3
 !
 !
 mpls traffic-eng router-id 209.165.200.227
!
router bgp 100
 nsr
 bgp router-id 209.165.200.227
 bgp graceful-restart
 address-family l2vpn vpls-vpws
 !
 neighbor 209.165.200.225
 remote-as 100
 update-source Loopback0
 address-family l2vpn vpls-vpws
 !
 !
 neighbor 209.165.200.226
 remote-as 100
 update-source Loopback0
 address-family l2vpn vpls-vpws
 !
 !
 neighbor 209.165.200.228
 remote-as 100
 update-source Loopback0
 address-family l2vpn vpls-vpws
 !
 !
!
l2vpn
 bridge group bg1
 bridge-domain bg1_bd1
  interface GigabitEthernet0/3/0/2.1
  !
  vfi bg1_bd1_vfi
   vpn-id 1
   autodiscovery bgp
    rd auto
    route-target 209.165.201.1:1
    signaling-protocol bgp
     ve-id 300
    !
   !
   multicast p2mp
    signaling-protocol bgp
    !
    transport rsvp-te
     attribute-set p2mp-te set1
    !
   !
  !
 !
 !
!
rsvp
 interface GigabitEthernet0/3/0/3
 bandwidth 100000
 !
!
mpls traffic-eng
 interface GigabitEthernet0/3/0/3
 !
```

```
 auto-tunnel p2mp
 tunnel-id min 100 max 200
 !
 auto-tunnel backup
 tunnel-id min 1000 max 1500
 !
 attribute-set p2mp-te set1
 bandwidth 10000
 fast-reroute
 record-route
 !
!
mpls ldp
 nsr
 graceful-restart
 router-id 209.165.200.227
 interface GigabitEthernet0/3/0/3
 !
!
end

RP/0/RSP0/CPU0:PE2#
```

## Configuração PE3

```
RP/0/RSP0/CPU0:PE3#show run
hostname PE3
ipv4 unnumbered mpls traffic-eng Loopback0

interface Loopback0
 ipv4 address 209.165.200.228 255.255.255.255
!
interface GigabitEthernet0/2/1/8
 description connected to P router
 ipv4 address 209.165.201.102 255.255.255.224
 transceiver permit pid all
!
interface GigabitEthernet0/2/1/11
 transceiver permit pid all
!
interface GigabitEthernet0/2/1/11.1 l2transport
 encapsulation dot1q 1
!
router ospf 100
 nsr
 router-id 209.165.200.228
 nsf cisco
 area 0
 mpls traffic-eng
 interface Loopback0
 !
 interface GigabitEthernet0/2/1/8
 !
 !
 mpls traffic-eng router-id 209.165.200.228
!
router bgp 100
 nsr
 bgp router-id 209.165.200.228
 bgp graceful-restart
 address-family l2vpn vpls-vpws
 !
 neighbor 209.165.200.225
```

```
 remote-as 100
 update-source Loopback0
 address-family l2vpn vpls-vpws
 !
 !
 neighbor 209.165.200.226
 remote-as 100
 update-source Loopback0
 address-family l2vpn vpls-vpws
 !
 !
 neighbor 209.165.200.227
 remote-as 100
 update-source Loopback0
 address-family l2vpn vpls-vpws
 !
 !
!
l2vpn
 bridge group bg1
 bridge-domain bg1_bd1
  interface GigabitEthernet0/2/1/11.1
  !
  vfi bg1_bd1_vfi
   vpn-id 1
   autodiscovery bgp
    rd auto
    route-target 209.165.201.1:1
    signaling-protocol bgp
     ve-id 400
    !
   !
   multicast p2mp
    signaling-protocol bgp
    !
    transport rsvp-te
     attribute-set p2mp-te set1
    !
   !
  !
 !
 !
!
rsvp
 interface GigabitEthernet0/2/1/8
 bandwidth 1000000
 !
!
mpls traffic-eng
 interface GigabitEthernet0/2/1/8
 !
 auto-tunnel p2mp
 tunnel-id min 100 max 200
 !
 auto-tunnel backup
 tunnel-id min 1000 max 1500
 !
 attribute-set p2mp-te set1
 bandwidth 10000
 fast-reroute
 record-route
 !
!
mpls ldp
```

```
 nsr
 graceful-restart
 router-id 209.165.200.228
 interface GigabitEthernet0/2/1/8
 !
!
end

RP/0/RSP0/CPU0:PE3#
```

# Verifique - Comandos show

Estes comandos show são úteis a fim debugar e verificar o estado dos túneis do MPLS TE P2MP picowatt e P2MP.

- mostre o domínio de Bridge l2vpn
- mostre o detalhe do domínio de Bridge l2vpn
- mostre a mpls os túneis tráfego-ingleses p2mp
- mostre os mpls que enviam o detalhe do <label> das etiquetas
- mostre a mpls os túneis tráfego-ingleses p2mp tabular

Aqui estão alguns exemplos:

**show l2vpn bridge-domain**

```
RP/0/RSP0/CPU0:PE1#show l2vpn bridge-domain
Legend: pp = Partially Programmed.
Bridge group: bg1, bridge-domain: bg1_bd1, id: 0, state: up, ShgId: 0, MSTi: 0
 Aging: 300 s, MAC limit: 4000, Action: none, Notification: syslog
 Filter MAC addresses: 0
 ACs: 1 (1 up), VFIs: 1, PWs: 3 (3 up), PBBs: 0 (0 up)
 List of ACs:
   GigabitEthernet0/1/1/10.1, state: up, Static MAC addresses: 0
 List of Access PWs:
 List of VFIs:
   VFI bg1_bd1_vfi (up)
     P2MP: RSVP-TE, BGP, 1, Tunnel Up
     Neighbor 209.165.200.226 pw-id 1, state: up, Static MAC addresses: 0
     Neighbor 209.165.200.227 pw-id 1, state: up, Static MAC addresses: 0
     Neighbor 209.165.200.228 pw-id 1, state: up, Static MAC addresses: 0
RP/0/RSP0/CPU0:PE1#
```

**show l2vpn bridge-domain detail**

```
RP/0/RSP0/CPU0:PE1#show l2vpn bridge-domain detail
Legend: pp = Partially Programmed.
Bridge group: bg1, bridge-domain: bg1_bd1, id: 0, state: up, ShgId: 0, MSTi: 0
 Coupled state: disabled
 MAC learning: enabled
 MAC withdraw: enabled
   MAC withdraw for Access PW: enabled
   MAC withdraw sent on: bridge port up
   MAC withdraw relaying (access to access): disabled
 Flooding:
   Broadcast & Multicast: enabled
   Unknown unicast: enabled
 MAC aging time: 300 s, Type: inactivity
 MAC limit: 4000, Action: none, Notification: syslog
 MAC limit reached: no
```

```
 MAC port down flush: enabled
 MAC Secure: disabled, Logging: disabled
 Split Horizon Group: none
 Dynamic ARP Inspection: disabled, Logging: disabled
 IP Source Guard: disabled, Logging: disabled
 DHCPv4 snooping: disabled
 IGMP Snooping: enabled
  IGMP Snooping profile: none
 MLD Snooping profile: none
 Storm Control: disabled
 Bridge MTU: 1500
 MIB cvplsConfigIndex: 1
 Filter MAC addresses:
 P2MP PW: enabled
 Create time: 18/02/2014 03:47:59 (00:41:54 ago)
 No status change since creation
 ACs: 1 (1 up), VFIs: 1, PWs: 3 (3 up), PBBs: 0 (0 up)
 List of ACs:
   AC: GigabitEthernet0/1/1/10.1, state is up
     Type VLAN; Num Ranges: 1
     VLAN ranges: [1, 1]
     MTU 1504; XC ID 0x8802a7; interworking none
     MAC learning: enabled
     Flooding:
       Broadcast & Multicast: enabled
       Unknown unicast: enabled
     MAC aging time: 300 s, Type: inactivity
     MAC limit: 4000, Action: none, Notification: syslog
     MAC limit reached: no
     MAC port down flush: enabled
     MAC Secure: disabled, Logging: disabled
     Split Horizon Group: none
     Dynamic ARP Inspection: disabled, Logging: disabled
     IP Source Guard: disabled, Logging: disabled
     DHCPv4 snooping: disabled
     IGMP Snooping: enabled
     IGMP Snooping profile: none
     MLD Snooping profile: none
     Storm Control: disabled
     Static MAC addresses:
     Statistics:
       packets: received 0, sent 0
       bytes: received 0, sent 0
     Storm control drop counters:
       packets: broadcast 0, multicast 0, unknown unicast 0
       bytes: broadcast 0, multicast 0, unknown unicast 0
     Dynamic ARP inspection drop counters:
       packets: 0, bytes: 0
     IP source guard drop counters:
       packets: 0, bytes: 0
 List of Access PWs:
 List of VFIs:
   VFI bg1_bd1_vfi (up)
     P2MP:
        Type RSVP-TE, BGP signaling, PTree ID 1
        P2MP Status: Tunnel Up
        P2MP-TE attribute-set: set1
        Tunnel tunnel-mte100, Local Label: 289994
      VPN-ID: 1, Auto Discovery: BGP, state is Provisioned (Service Connected)
Route Distinguisher:  (auto) 209.165.200.225:32768
     Import Route Targets:
       209.165.201.1:1
     Export Route Targets:
       209.165.201.1:1
```

```
Signaling protocol: BGP
Local VE-ID: 100 ,  Advertised Local VE-ID : 100
VE-Range: 10
PW: neighbor 209.165.200.226, PW ID 1, state is up ( established )
  PW class not set, XC ID 0xc0000001
  Encapsulation MPLS, Auto-discovered (BGP), protocol BGP
  Source address 209.165.200.225
  PW type VPLS, control word disabled, interworking none
  Sequencing not set

    MPLS         Local                          Remote
    ------------ ------------------------------ -------------------------
    Label        289959                         16030
    MTU          1500                           1500
    Control word disabled                       disabled
    PW type      VPLS                           VPLS
    VE-ID        100                            200
    ------------ ------------------------------ -------------------------
  MIB cpwVcIndex: 3221225473
  Create time: 18/02/2014 03:58:31 (00:31:23 ago)
  Last time status changed: 18/02/2014 03:58:31 (00:31:23 ago)
  MAC withdraw messages: sent 0, received 0
  Static MAC addresses:
  Statistics:
    packets: received 0, sent 0
    bytes: received 0, sent 0
  Storm control drop counters:
    packets: broadcast 0, multicast 0, unknown unicast 0
    bytes: broadcast 0, multicast 0, unknown unicast 0
DHCPv4 snooping: disabled
IGMP Snooping profile: none
MLD Snooping profile: none
  P2MP-PW:
      FEC            Local                          Remote
      -------------- ------------------------------ ----------------------
      Label          NULL (inclusive tree)          NULL (inclusive tree)
      P2MP ID        100                            100
      Flags          0x00                           0x00
      PTree Type     RSVP-TE                        RSVP-TE
      Tunnel ID      100                            100
      Ext. Tunnel ID 209.165.200.225                209.165.200.226
    Statistics:
      packets: received 0
      bytes: received 0
PW: neighbor 209.165.200.227, PW ID 1, state is up ( established )
  PW class not set, XC ID 0xc0000002
  Encapsulation MPLS, Auto-discovered (BGP), protocol BGP
  Source address 209.165.200.225
  PW type VPLS, control word disabled, interworking none
  Sequencing not set

    MPLS         Local                          Remote
    ------------ ------------------------------ -------------------------
    Label        289944                         16030
    MTU          1500                           1500
    Control word disabled                       disabled
    PW type      VPLS                           VPLS
    VE-ID        100                            300
    ------------ ------------------------------ -------------------------
  MIB cpwVcIndex: 3221225474
  Create time: 18/02/2014 04:05:25 (00:24:29 ago)
  Last time status changed: 18/02/2014 04:05:25 (00:24:29 ago)
  MAC withdraw messages: sent 0, received 0
  Static MAC addresses:
```

```
  Statistics:
    packets: received 0, sent 0
    bytes: received 0, sent 0
  Storm control drop counters:
    packets: broadcast 0, multicast 0, unknown unicast 0
    bytes: broadcast 0, multicast 0, unknown unicast 0
DHCPv4 snooping: disabled
IGMP Snooping profile: none
MLD Snooping profile: none
  P2MP-PW:
      FEC            Local                          Remote
      -------------- ------------------------------ ----------------------
      Label          NULL (inclusive tree)          NULL (inclusive tree)
      P2MP ID        100                            100
      Flags          0x00                           0x00
      PTree Type     RSVP-TE                        RSVP-TE
      Tunnel ID      100                            100
      Ext. Tunnel ID 209.165.200.225                209.165.200.227
    Statistics:
      packets: received 0
      bytes: received 0
PW: neighbor 209.165.200.228, PW ID 1, state is up ( established )
  PW class not set, XC ID 0xc0000003
  Encapsulation MPLS, Auto-discovered (BGP), protocol BGP
  Source address 209.165.200.225
  PW type VPLS, control word disabled, interworking none
  Sequencing not set

    MPLS         Local                          Remote
    ------------ ------------------------------ -------------------------
    Label        289929                         16045
    MTU          1500                           1500
    Control word disabled                       disabled
    PW type      VPLS                           VPLS
    VE-ID        100                            400
    ------------ ------------------------------ -------------------------
  MIB cpwVcIndex: 3221225475
  Create time: 18/02/2014 04:08:11 (00:21:43 ago)
  Last time status changed: 18/02/2014 04:08:11 (00:21:43 ago)
  MAC withdraw messages: sent 0, received 0
  Static MAC addresses:
  Statistics:
    packets: received 0, sent 0
    bytes: received 0, sent 0
  Storm control drop counters:
    packets: broadcast 0, multicast 0, unknown unicast 0
    bytes: broadcast 0, multicast 0, unknown unicast 0
DHCPv4 snooping: disabled
IGMP Snooping profile: none
MLD Snooping profile: none
  P2MP-PW:
      FEC            Local                          Remote
      -------------- ------------------------------ ----------------------
      Label          NULL (inclusive tree)          NULL (inclusive tree)
      P2MP ID        100                            100
      Flags          0x00                           0x00
      PTree Type     RSVP-TE                        RSVP-TE
      Tunnel ID      100                            100
      Ext. Tunnel ID 209.165.200.225                209.165.200.228
    Statistics:
      packets: received 0
      bytes: received 0
VFI Statistics:
  drops: illegal VLAN 0, illegal length 0
```

```
RP/0/RSP0/CPU0:PE1#
```

**show mpls traffic-eng tunnels p2mp**

```
RP/0/RSP0/CPU0:PE1#show mpls traffic-eng tunnels p2mp


Name: tunnel-mte100 (auto-tunnel for VPLS (l2vpn))
  Signalled-Name: auto_PE1_mt100
  Status:
    Admin: up  Oper: up (Up for 00:32:35)

    Config Parameters:
     Bandwidth: 0 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
     Interface Bandwidth: 10000 kbps
     Metric Type: TE (default)
     Fast Reroute: Enabled, Protection Desired: Any
     Record Route: Enabled
     Reoptimization after affinity failure: Enabled

     Attribute-set: set1 (type p2mp-te)
     Destination summary: (3 up, 0 down, 0 disabled) Affinity: 0x0/0xffff
     Auto-bw: disabled
     Destination: 209.165.200.226
       State: Up for 00:32:35
       Path options:
         path-option 10 dynamic     [active]
     Destination: 209.165.200.227
       State: Up for 00:25:41
       Path options:
         path-option 10 dynamic     [active]
     Destination: 209.165.200.228
       State: Up for 00:22:55
       Path options:
         path-option 10 dynamic     [active]

   Current LSP:
     lsp-id: 10004 p2mp-id: 100 tun-id: 100 src: 209.165.200.225 extid:
209.165.200.225
     LSP up for: 00:32:35 (since Tue Feb 18 03:58:31 UTC 2014)
     Reroute Pending: No
     Inuse Bandwidth: 0 kbps (CT0)
     Number of S2Ls: 3 connected, 0 signaling proceeding, 0 down

     S2L Sub LSP: Destination 209.165.200.226 Signaling Status: connected
       S2L up for: 00:32:35 (since Tue Feb 18 03:58:31 UTC 2014)
       Sub Group ID: 1 Sub Group Originator ID: 209.165.200.225
       Path option path-option 10 dynamic    (path weight 1)
       Path info (OSPF 100 area 0)
         209.165.201.2
         209.165.200.226

     S2L Sub LSP: Destination 209.165.200.227 Signaling Status: connected
       S2L up for: 00:25:41 (since Tue Feb 18 04:05:25 UTC 2014)
       Sub Group ID: 2 Sub Group Originator ID: 209.165.200.225
       Path option path-option 10 dynamic    (path weight 2)
       Path info (OSPF 100 area 0)
         209.165.201.2
         209.165.201.61
         209.165.201.62
         209.165.200.227

     S2L Sub LSP: Destination 209.165.200.228 Signaling Status: connected
```

```
       S2L up for: 00:22:55 (since Tue Feb 18 04:08:11 UTC 2014)
       Sub Group ID: 4 Sub Group Originator ID: 209.165.200.225
       Path option path-option 10 dynamic    (path weight 2)
       Path info (OSPF 100 area 0)
         209.165.201.2
         209.165.201.101
         209.165.201.102
         209.165.200.228

   Reoptimized LSP (Install Timer Remaining 0 Seconds):
     None
   Cleaned LSP (Cleanup Timer Remaining 0 Seconds):
     None

LSP Tunnel 209.165.200.226 100 [10005] is signalled, connection is up
 Tunnel Name: auto_P_mt100 Tunnel Role: Tail
 InLabel: GigabitEthernet0/1/1/0, 289995
 Signalling Info:
   Src 209.165.200.226 Dst 209.165.200.225, Tun ID 100, Tun Inst 10005, Ext ID
209.165.200.226
   Router-IDs: upstream   209.165.200.226
               local      209.165.200.225
   Bandwidth: 0 kbps (CT0) Priority:  7  7 DSTE-class: 0
   Soft Preemption: None
   Path Info:
     Incoming Address: 209.165.201.1
     Incoming:
     Explicit Route:
       Strict, 209.165.201.1
       Strict, 209.165.200.225
     Record Route:
       IPv4 209.165.201.2, flags 0x0
     Tspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits
     Session Attributes: Local Prot: Set, Node Prot: Not Set, BW Prot: Not Set
                         Soft Preemption Desired: Not Set
   Resv Info: None
     Record Route: Empty
     Resv Info:
       Record Route: Empty
       Fspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits

LSP Tunnel 209.165.200.227 100 [10003] is signalled, connection is up
 Tunnel Name: auto_PE2_mt100 Tunnel Role: Tail
 InLabel: GigabitEthernet0/1/1/0, 289998
 Signalling Info:
   Src 209.165.200.227 Dst 209.165.200.225, Tun ID 100, Tun Inst 10003, Ext ID
209.165.200.227
   Router-IDs: upstream   209.165.200.226
               local      209.165.200.225
   Bandwidth: 0 kbps (CT0) Priority:  7  7 DSTE-class: 0
   Soft Preemption: None
   Path Info:
     Incoming Address: 209.165.201.1
     Incoming:
     Explicit Route:
       Strict, 209.165.201.1
       Strict, 209.165.200.225
     Record Route:
       IPv4 209.165.201.2, flags 0x0
       IPv4 209.165.201.62, flags 0x0
     Tspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits
     Session Attributes: Local Prot: Set, Node Prot: Not Set, BW Prot: Not Set
                         Soft Preemption Desired: Not Set
   Resv Info: None
```

```
     Record Route: Empty
     Resv Info:
       Record Route: Empty
       Fspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits

LSP Tunnel 209.165.200.228 100 [10004] is signalled, connection is up
 Tunnel Name: auto_PE3_mt100 Tunnel Role: Tail
 InLabel: GigabitEthernet0/1/1/0, 289970
 Signalling Info:
   Src 209.165.200.228 Dst 209.165.200.225, Tun ID 100, Tun Inst 10004, Ext ID
209.165.200.228
   Router-IDs: upstream   209.165.200.226
               local      209.165.200.225
   Bandwidth: 0 kbps (CT0) Priority:  7  7 DSTE-class: 0
   Soft Preemption: None
   Path Info:
     Incoming Address: 209.165.201.1
     Incoming:
     Explicit Route:
       Strict, 209.165.201.1
       Strict, 209.165.200.225
     Record Route:
       IPv4 209.165.201.2, flags 0x0
       IPv4 209.165.201.102, flags 0x0
     Tspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits
     Session Attributes: Local Prot: Set, Node Prot: Not Set, BW Prot: Not Set
                         Soft Preemption Desired: Not Set
   Resv Info: None
     Record Route: Empty
     Resv Info:
       Record Route: Empty
       Fspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits
Displayed 1 (of 2) heads, 0 (of 0) midpoints, 3 (of 4) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads
RP/0/RSP0/CPU0:PE1#
```

**show mpls forwarding labels <label> detail**

```
RP/0/RSP0/CPU0:PE1#show mpls forwarding labels 289994 detail
Local  Outgoing    Prefix             Outgoing     Next Hop        Bytes
Label  Label       or ID              Interface                    Switched
------ ----------- ------------------ ------------ --------------- ------------
289994             P2MP TE: 100
      Updated Feb 18 03:58:32.360
      TE Tunnel Head, tunnel ID: 100, tunnel ifh: 0x8000e20
      IPv4 Tableid: 0xe0000000, IPv6 Tableid: 0xe0800000
      Flags:IP Lookup:not-set, Expnullv4:not-set, Expnullv6:set
            Payload Type v4:set, Payload Type v6:not-set, l2vpn:set
            Head:set, Tail:not-set, Bud:not-set, Peek:not-set, inclusive:set
            Ingress Drop:not-set, Egress Drop:not-set
      Platform Data&colon;{0x2000000, 0x2000000, 0x0, 0x0}, RPF-ID:0x80003
      VPLS Disposition: Bridge ID: 0, SHG ID: 0, PW Xconnect ID: 0x0

      mpls paths: 1, local mpls paths: 0, protected mpls paths: 1

      16005       P2MP TE: 100       Gi0/1/1/0    209.165.201.2   0
        Updated Feb 18 03:58:32.360
        My Nodeid:65, Interface Nodeid:2065, Backup Interface Nodeid:2065
Packets Switched: 0

RP/0/RSP0/CPU0:PE1#
```

**show mpls traffic-eng tunnels p2mp tabular**

```
RP/0/RSP0/CPU0:PE1#show mpls traffic-eng tunnels p2mp tabular

          Tunnel   LSP     Destination          Source           FRR  LSP  Path
            Name    ID         Address         Address  State  State Role  Prot
----------------- ----- --------------- --------------- ------ ------ ---- -----
  ^tunnel-mte100 10004 209.165.200.226 209.165.200.225     up  Ready Head
  ^tunnel-mte100 10004 209.165.200.227 209.165.200.225     up  Ready Head
  ^tunnel-mte100 10004 209.165.200.228 209.165.200.225     up  Ready Head
    auto_P_mt100 10005 209.165.200.225 209.165.200.226     up  Inact Tail
  auto_PE2_mt100 10003 209.165.200.225 209.165.200.227     up  Inact Tail
  auto_PE3_mt100 10004 209.165.200.225 209.165.200.228     up  Inact Tail
* = automatically created backup tunnel
^ = automatically created P2MP tunnel
RP/0/RSP0/CPU0:PE1#
```

# Pesquise defeitos VPL LS

## Edições da configuração comum

A maioria de causas comum para problemas P2MP no L2VPN são mostradas aqui.

- A configuração de BGP para o LS é exatamente a mesma que aquela para BGP-AD. Certifique-se exportar/rotas da família endereço da importação l2vpn VPL-vpws configurando a endereço-**família l2vpn VPL-vpws** para vizinhos de BGP.

- Há MPLS e erros de configuração do Multicast.

  A Engenharia de tráfego MPLS deve ser permitida nas relações aonde o P2MP PWs passa.

  **show l2vpn bridge-domain**

  ```
  RP/0/RSP0/CPU0:PE1#show l2vpn bridge-domain
  Legend: pp = Partially Programmed.
  Bridge group: bg1, bridge-domain: bg1_bd1, id: 0, state: up, ShgId: 0, MSTi: 0
   Aging: 300 s, MAC limit: 4000, Action: none, Notification: syslog
   Filter MAC addresses: 0
   ACs: 1 (1 up), VFIs: 1, PWs: 3 (3 up), PBBs: 0 (0 up)
   List of ACs:
     GigabitEthernet0/1/1/10.1, state: up, Static MAC addresses: 0
   List of Access PWs:
   List of VFIs:
     VFI bg1_bd1_vfi (up)
       P2MP: RSVP-TE, BGP, 1, Tunnel Up
       Neighbor 209.165.200.226 pw-id 1, state: up, Static MAC addresses: 0
       Neighbor 209.165.200.227 pw-id 1, state: up, Static MAC addresses: 0
       Neighbor 209.165.200.228 pw-id 1, state: up, Static MAC addresses: 0
  RP/0/RSP0/CPU0:PE1#
  ```

  **show l2vpn bridge-domain detail**

  ```
  RP/0/RSP0/CPU0:PE1#show l2vpn bridge-domain detail
  Legend: pp = Partially Programmed.
  Bridge group: bg1, bridge-domain: bg1_bd1, id: 0, state: up, ShgId: 0, MSTi: 0
  ```

```
Coupled state: disabled
MAC learning: enabled
MAC withdraw: enabled
  MAC withdraw for Access PW: enabled
  MAC withdraw sent on: bridge port up
  MAC withdraw relaying (access to access): disabled
Flooding:
  Broadcast & Multicast: enabled
  Unknown unicast: enabled
MAC aging time: 300 s, Type: inactivity
MAC limit: 4000, Action: none, Notification: syslog
MAC limit reached: no
MAC port down flush: enabled
MAC Secure: disabled, Logging: disabled
Split Horizon Group: none
Dynamic ARP Inspection: disabled, Logging: disabled
IP Source Guard: disabled, Logging: disabled
DHCPv4 snooping: disabled
IGMP Snooping: enabled
 IGMP Snooping profile: none
MLD Snooping profile: none
Storm Control: disabled
Bridge MTU: 1500
MIB cvplsConfigIndex: 1
Filter MAC addresses:
P2MP PW: enabled
Create time: 18/02/2014 03:47:59 (00:41:54 ago)
No status change since creation
ACs: 1 (1 up), VFIs: 1, PWs: 3 (3 up), PBBs: 0 (0 up)
List of ACs:
  AC: GigabitEthernet0/1/1/10.1, state is up
    Type VLAN; Num Ranges: 1
    VLAN ranges: [1, 1]
    MTU 1504; XC ID 0x8802a7; interworking none
    MAC learning: enabled
    Flooding:
      Broadcast & Multicast: enabled
      Unknown unicast: enabled
    MAC aging time: 300 s, Type: inactivity
    MAC limit: 4000, Action: none, Notification: syslog
    MAC limit reached: no
    MAC port down flush: enabled
    MAC Secure: disabled, Logging: disabled
    Split Horizon Group: none
    Dynamic ARP Inspection: disabled, Logging: disabled
    IP Source Guard: disabled, Logging: disabled
    DHCPv4 snooping: disabled
    IGMP Snooping: enabled
    IGMP Snooping profile: none
    MLD Snooping profile: none
    Storm Control: disabled
    Static MAC addresses:
    Statistics:
      packets: received 0, sent 0
      bytes: received 0, sent 0
    Storm control drop counters:
      packets: broadcast 0, multicast 0, unknown unicast 0
      bytes: broadcast 0, multicast 0, unknown unicast 0
    Dynamic ARP inspection drop counters:
      packets: 0, bytes: 0
    IP source guard drop counters:
      packets: 0, bytes: 0
List of Access PWs:
List of VFIs:
```

```
   VFI bg1_bd1_vfi (up)
     P2MP:
        Type RSVP-TE, BGP signaling, PTree ID 1
        P2MP Status: Tunnel Up
        P2MP-TE attribute-set: set1
        Tunnel tunnel-mte100, Local Label: 289994
      VPN-ID: 1, Auto Discovery: BGP, state is Provisioned (Service Connected)
Route Distinguisher:  (auto) 209.165.200.225:32768
     Import Route Targets:
       209.165.201.1:1
     Export Route Targets:
       209.165.201.1:1
     Signaling protocol: BGP
     Local VE-ID: 100 ,  Advertised Local VE-ID : 100
     VE-Range: 10
     PW: neighbor 209.165.200.226, PW ID 1, state is up ( established )
       PW class not set, XC ID 0xc0000001
       Encapsulation MPLS, Auto-discovered (BGP), protocol BGP
       Source address 209.165.200.225
       PW type VPLS, control word disabled, interworking none
       Sequencing not set

         MPLS         Local                          Remote
         ------------ ------------------------------ ------------------------
         Label        289959                         16030
         MTU          1500                           1500
         Control word disabled                       disabled
         PW type      VPLS                           VPLS
         VE-ID        100                            200
         ------------ ------------------------------ ------------------------
       MIB cpwVcIndex: 3221225473
       Create time: 18/02/2014 03:58:31 (00:31:23 ago)
       Last time status changed: 18/02/2014 03:58:31 (00:31:23 ago)
       MAC withdraw messages: sent 0, received 0
       Static MAC addresses:
       Statistics:
         packets: received 0, sent 0
         bytes: received 0, sent 0
       Storm control drop counters:
         packets: broadcast 0, multicast 0, unknown unicast 0
         bytes: broadcast 0, multicast 0, unknown unicast 0
     DHCPv4 snooping: disabled
     IGMP Snooping profile: none
     MLD Snooping profile: none
       P2MP-PW:
           FEC            Local                          Remote
           -------------- ------------------------------ ----------------------
           Label          NULL (inclusive tree)          NULL (inclusive tree)
           P2MP ID        100                            100
           Flags          0x00                           0x00
           PTree Type     RSVP-TE                        RSVP-TE
           Tunnel ID      100                            100
           Ext. Tunnel ID 209.165.200.225                209.165.200.226
         Statistics:
           packets: received 0
           bytes: received 0
     PW: neighbor 209.165.200.227, PW ID 1, state is up ( established )
       PW class not set, XC ID 0xc0000002
       Encapsulation MPLS, Auto-discovered (BGP), protocol BGP
       Source address 209.165.200.225
       PW type VPLS, control word disabled, interworking none
       Sequencing not set

         MPLS         Local                          Remote
```

```
    ------------ ----------------------------- ------------------------
    Label        289944                        16030
    MTU          1500                          1500
    Control word disabled                      disabled
    PW type      VPLS                          VPLS
    VE-ID        100                           300
    ------------ ----------------------------- ------------------------
  MIB cpwVcIndex: 3221225474
  Create time: 18/02/2014 04:05:25 (00:24:29 ago)
  Last time status changed: 18/02/2014 04:05:25 (00:24:29 ago)
  MAC withdraw messages: sent 0, received 0
  Static MAC addresses:
  Statistics:
    packets: received 0, sent 0
    bytes: received 0, sent 0
  Storm control drop counters:
    packets: broadcast 0, multicast 0, unknown unicast 0
    bytes: broadcast 0, multicast 0, unknown unicast 0
DHCPv4 snooping: disabled
IGMP Snooping profile: none
MLD Snooping profile: none
  P2MP-PW:
      FEC            Local                         Remote
      -------------- ----------------------------- ----------------------
      Label          NULL (inclusive tree)         NULL (inclusive tree)
      P2MP ID        100                           100
      Flags          0x00                          0x00
      PTree Type     RSVP-TE                       RSVP-TE
      Tunnel ID      100                           100
      Ext. Tunnel ID 209.165.200.225               209.165.200.227
    Statistics:
      packets: received 0
      bytes: received 0
PW: neighbor 209.165.200.228, PW ID 1, state is up ( established )
  PW class not set, XC ID 0xc0000003
  Encapsulation MPLS, Auto-discovered (BGP), protocol BGP
  Source address 209.165.200.225
  PW type VPLS, control word disabled, interworking none
  Sequencing not set

    MPLS         Local                         Remote
    ------------ ----------------------------- ------------------------
    Label        289929                        16045
    MTU          1500                          1500
    Control word disabled                      disabled
    PW type      VPLS                          VPLS
    VE-ID        100                           400
    ------------ ----------------------------- ------------------------
  MIB cpwVcIndex: 3221225475
  Create time: 18/02/2014 04:08:11 (00:21:43 ago)
  Last time status changed: 18/02/2014 04:08:11 (00:21:43 ago)
  MAC withdraw messages: sent 0, received 0
  Static MAC addresses:
  Statistics:
    packets: received 0, sent 0
    bytes: received 0, sent 0
  Storm control drop counters:
    packets: broadcast 0, multicast 0, unknown unicast 0
    bytes: broadcast 0, multicast 0, unknown unicast 0
DHCPv4 snooping: disabled
IGMP Snooping profile: none
MLD Snooping profile: none
  P2MP-PW:
      FEC            Local                         Remote
```

```
          -------------- ---------------------------- ----------------------
          Label          NULL (inclusive tree)        NULL (inclusive tree)
          P2MP ID        100                          100
          Flags          0x00                         0x00
          PTree Type     RSVP-TE                      RSVP-TE
          Tunnel ID      100                          100
          Ext. Tunnel ID 209.165.200.225              209.165.200.228
        Statistics:
          packets: received 0
          bytes: received 0
    VFI Statistics:
      drops: illegal VLAN 0, illegal length 0
RP/0/RSP0/CPU0:PE1#
```

**show mpls traffic-eng tunnels p2mp**

```
RP/0/RSP0/CPU0:PE1#show mpls traffic-eng tunnels p2mp


Name: tunnel-mte100 (auto-tunnel for VPLS (l2vpn))
  Signalled-Name: auto_PE1_mt100
  Status:
    Admin: up  Oper: up (Up for 00:32:35)

    Config Parameters:
     Bandwidth: 0 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
     Interface Bandwidth: 10000 kbps
     Metric Type: TE (default)
     Fast Reroute: Enabled, Protection Desired: Any
     Record Route: Enabled
     Reoptimization after affinity failure: Enabled

     Attribute-set: set1 (type p2mp-te)
     Destination summary: (3 up, 0 down, 0 disabled) Affinity: 0x0/0xffff
     Auto-bw: disabled
     Destination: 209.165.200.226
       State: Up for 00:32:35
       Path options:
         path-option 10 dynamic     [active]
     Destination: 209.165.200.227
       State: Up for 00:25:41
       Path options:
         path-option 10 dynamic     [active]
     Destination: 209.165.200.228
       State: Up for 00:22:55
       Path options:
         path-option 10 dynamic     [active]

   Current LSP:
     lsp-id: 10004 p2mp-id: 100 tun-id: 100 src: 209.165.200.225 extid:
209.165.200.225
     LSP up for: 00:32:35 (since Tue Feb 18 03:58:31 UTC 2014)
     Reroute Pending: No
     Inuse Bandwidth: 0 kbps (CT0)
     Number of S2Ls: 3 connected, 0 signaling proceeding, 0 down

     S2L Sub LSP: Destination 209.165.200.226 Signaling Status: connected
       S2L up for: 00:32:35 (since Tue Feb 18 03:58:31 UTC 2014)
       Sub Group ID: 1 Sub Group Originator ID: 209.165.200.225
       Path option path-option 10 dynamic    (path weight 1)
       Path info (OSPF 100 area 0)
         209.165.201.2
         209.165.200.226
```

```
     S2L Sub LSP: Destination 209.165.200.227 Signaling Status: connected
       S2L up for: 00:25:41 (since Tue Feb 18 04:05:25 UTC 2014)
       Sub Group ID: 2 Sub Group Originator ID: 209.165.200.225
       Path option path-option 10 dynamic    (path weight 2)
       Path info (OSPF 100 area 0)
         209.165.201.2
         209.165.201.61
         209.165.201.62
         209.165.200.227

     S2L Sub LSP: Destination 209.165.200.228 Signaling Status: connected
       S2L up for: 00:22:55 (since Tue Feb 18 04:08:11 UTC 2014)
       Sub Group ID: 4 Sub Group Originator ID: 209.165.200.225
       Path option path-option 10 dynamic    (path weight 2)
       Path info (OSPF 100 area 0)
         209.165.201.2
         209.165.201.101
         209.165.201.102
         209.165.200.228

   Reoptimized LSP (Install Timer Remaining 0 Seconds):
     None
   Cleaned LSP (Cleanup Timer Remaining 0 Seconds):
     None

LSP Tunnel 209.165.200.226 100 [10005] is signalled, connection is up
 Tunnel Name: auto_P_mt100 Tunnel Role: Tail
 InLabel: GigabitEthernet0/1/1/0, 289995
 Signalling Info:
   Src 209.165.200.226 Dst 209.165.200.225, Tun ID 100, Tun Inst 10005, Ext ID
209.165.200.226
   Router-IDs: upstream   209.165.200.226
               local      209.165.200.225
   Bandwidth: 0 kbps (CT0) Priority:  7  7 DSTE-class: 0
   Soft Preemption: None
   Path Info:
     Incoming Address: 209.165.201.1
     Incoming:
     Explicit Route:
       Strict, 209.165.201.1
       Strict, 209.165.200.225
     Record Route:
       IPv4 209.165.201.2, flags 0x0
     Tspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits
     Session Attributes: Local Prot: Set, Node Prot: Not Set, BW Prot: Not Set
                         Soft Preemption Desired: Not Set
   Resv Info: None
     Record Route: Empty
     Resv Info:
       Record Route: Empty
       Fspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits

LSP Tunnel 209.165.200.227 100 [10003] is signalled, connection is up
 Tunnel Name: auto_PE2_mt100 Tunnel Role: Tail
 InLabel: GigabitEthernet0/1/1/0, 289998
 Signalling Info:
   Src 209.165.200.227 Dst 209.165.200.225, Tun ID 100, Tun Inst 10003, Ext ID
209.165.200.227
   Router-IDs: upstream   209.165.200.226
               local      209.165.200.225
   Bandwidth: 0 kbps (CT0) Priority:  7  7 DSTE-class: 0
   Soft Preemption: None
   Path Info:
```

```
     Incoming Address: 209.165.201.1
     Incoming:
     Explicit Route:
       Strict, 209.165.201.1
       Strict, 209.165.200.225
     Record Route:
       IPv4 209.165.201.2, flags 0x0
       IPv4 209.165.201.62, flags 0x0
     Tspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits
     Session Attributes: Local Prot: Set, Node Prot: Not Set, BW Prot: Not Set
                         Soft Preemption Desired: Not Set
   Resv Info: None
     Record Route: Empty
     Resv Info:
       Record Route: Empty
       Fspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits

LSP Tunnel 209.165.200.228 100 [10004] is signalled, connection is up
 Tunnel Name: auto_PE3_mt100 Tunnel Role: Tail
 InLabel: GigabitEthernet0/1/1/0, 289970
 Signalling Info:
   Src 209.165.200.228 Dst 209.165.200.225, Tun ID 100, Tun Inst 10004, Ext ID
209.165.200.228
   Router-IDs: upstream   209.165.200.226
               local      209.165.200.225
   Bandwidth: 0 kbps (CT0) Priority:  7  7 DSTE-class: 0
   Soft Preemption: None
   Path Info:
     Incoming Address: 209.165.201.1
     Incoming:
     Explicit Route:
       Strict, 209.165.201.1
       Strict, 209.165.200.225
     Record Route:
       IPv4 209.165.201.2, flags 0x0
       IPv4 209.165.201.102, flags 0x0
     Tspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits
     Session Attributes: Local Prot: Set, Node Prot: Not Set, BW Prot: Not Set
                         Soft Preemption Desired: Not Set
   Resv Info: None
     Record Route: Empty
     Resv Info:
       Record Route: Empty
       Fspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits
Displayed 1 (of 2) heads, 0 (of 0) midpoints, 3 (of 4) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads
RP/0/RSP0/CPU0:PE1#
```

**show mpls forwarding labels <label> detail**

```
RP/0/RSP0/CPU0:PE1#show mpls forwarding labels 289994 detail
Local  Outgoing    Prefix             Outgoing     Next Hop        Bytes
Label  Label       or ID              Interface                    Switched
------ ----------- ------------------ ------------ --------------- ------------
289994             P2MP TE: 100
      Updated Feb 18 03:58:32.360
      TE Tunnel Head, tunnel ID: 100, tunnel ifh: 0x8000e20
      IPv4 Tableid: 0xe0000000, IPv6 Tableid: 0xe0800000
      Flags:IP Lookup:not-set, Expnullv4:not-set, Expnullv6:set
            Payload Type v4:set, Payload Type v6:not-set, l2vpn:set
            Head:set, Tail:not-set, Bud:not-set, Peek:not-set, inclusive:set
            Ingress Drop:not-set, Egress Drop:not-set
```

```
      Platform Data&colon;{0x2000000, 0x2000000, 0x0, 0x0}, RPF-ID:0x80003
      VPLS Disposition: Bridge ID: 0, SHG ID: 0, PW Xconnect ID: 0x0

      mpls paths: 1, local mpls paths: 0, protected mpls paths: 1

      16005       P2MP TE: 100       Gi0/1/1/0    209.165.201.2   0
        Updated Feb 18 03:58:32.360
        My Nodeid:65, Interface Nodeid:2065, Backup Interface Nodeid:2065
Packets Switched: 0

RP/0/RSP0/CPU0:PE1#


show mpls traffic-eng tunnels p2mp tabular

RP/0/RSP0/CPU0:PE1#show mpls traffic-eng tunnels p2mp tabular

          Tunnel   LSP     Destination          Source           FRR  LSP  Path
            Name    ID         Address         Address  State  State Role  Prot
---------------- ----- -------------- -------------- ------ ------ ---- -----
  ^tunnel-mte100 10004 209.165.200.226 209.165.200.225     up  Ready Head
  ^tunnel-mte100 10004 209.165.200.227 209.165.200.225     up  Ready Head
  ^tunnel-mte100 10004 209.165.200.228 209.165.200.225     up  Ready Head
    auto_P_mt100 10005 209.165.200.225 209.165.200.226     up  Inact Tail
  auto_PE2_mt100 10003 209.165.200.225 209.165.200.227     up  Inact Tail
  auto_PE3_mt100 10004 209.165.200.225 209.165.200.228     up  Inact Tail
* = automatically created backup tunnel
^ = automatically created P2MP tunnel
RP/0/RSP0/CPU0:PE1#
```

- A configuração L2VPN para o LS na liberação 5.1.0 do Cisco IOS XR exige que você:

  Configurar a Configuração de ID VPN para o VFIConfigurar o Multicast P2MP para o VFI. Confgure o protocolo de transporte e o protocolo de sinalização, como neste exemplo de configuração:
```
l2vpn
bridge group bg
 bridge-domain bd1
  vfi vf1
   vpn-id 1
   autodiscovery bgp
    rd auto
    route-target 209.165.201.7:1
    signaling-protocol bgp
      ve-id 1
  multicast p2mp
     signaling-protocol bgp
     transport rsvp-te
```

- A cabeça/Tail LS deve ser ajustada corretamente. No Cisco IOS XR libere 5.1.0, cada cauda LS é igualmente uma cabeça LS e vice-versa. Porque não há nenhum **intercâmbio de potencialidade** explícito **LS** entre o Roteadores, todo o Roteadores em um domínio de Bridge permitido LS deve participar no LS.

## Os comandos show L2VPN e L2FIB e pesquisam defeitos

- O processo de gerenciador L2VPN (l2vpn_mgr) comunica-se com o processo de controle da Engenharia de tráfego MPLS (TE) (te_control) e pede-se a criação de túnel. Assegure-se de que o te_control e os processos l2vpn_mgr estejam no estado de execução com estes

comandos:
**mostre o processo l2vpn_mgrmostre o te_control do processo**

- Certifique-se do processo l2vpn_mgr peça a criação de túnel. Uma entrada para o túnel deve estar neste comando show:

```
RP/0/RSP0/CPU0:PE1#show l2vpn atom-db preferred-path
Tunnel               BW Tot/Avail/Resv    Peer ID           VC ID
----------------------------------------------------------------------
tunnel-mte1 0/0/0                         209.165.200.226    1
                                                   209.165.200.227    1
                                                   209.165.200.228    1
```

- O L2VPN tem que receber a informação de túnel do processo do te_control. Verifique que este comando show tem detalhes diferente de zero tais como a túnel-identificação, o Ext.tunnel-id, o túnel-ifh, e o p2mp-id:

```
RP/0/RSP0/CPU0:PE1#show l2vpn atom-db preferred-path private
Tunnel tunnel-mte1 0/0/0:
 Peer ID: 209.165.200.226, VC-ID 1
 Peer ID: 209.165.200.227, VC-ID 1
 Peer ID: 209.165.200.228, VC-ID 1
 MTE details:
      tunnel-ifh: 0x08000e20
     local-label: 289994
         p2mp-id: 100
       tunnel-id: 100
   Ext.tunnel-id: 209.165.200.225
```

- O L2VPN deve anunciar o exemplo do serviço de transmissão múltipla do fornecedor (PMSI) a todos roteadores de PE restantes. Certifique-se de l2vpn_mgr envie o PMSI para o VFI configurado. **A cabeça do** evento **LS: envie PMSI** se estam presente na história do evento para o VFI.

```
RP/0/0/CPU0:one#show l2vpn bridge-domain p2mp private
[...]
  Object: VFI
  Base info: version=0x0, flags=0x0, type=0, reserved=0
  VFI event trace history  [Num events: 5]
  ------------------------------------------------------------------------
    Time                Event                          Flags      Flags
    ====                =====                          =====      =====
    Dec  3 08:52:37.504 LSM Head: P2MP Provision       00000001, 00000000 -  -
    Dec  3 08:52:37.504 BD VPN Add                     00000000, 00000000 M  -
    Dec  3 08:55:56.672 LSM Head: MTE updated          00000001, 00000000 -  -
    Dec  3 08:55:56.672 LSM Head: send PMSI            00000480, 00002710 -  -
  ------------------------------------------------------------------------
[...]
```

- O L2VPN no outro Roteadores deve receber o PMSI que foi enviado apenas. Assegure-se de que **Tail LS: PMSI recebido** é mostrado na história do evento no lado receptor:

```
RP/0/0/CPU0:two#show l2vpn bridge-domain p2mp private
[...]
  VFI event trace history  [Num events: 7]
  ------------------------------------------------------------------------
    Time                Event                          Flags      Flags
```

```
    ====                ======                          ======      ======
    Dec  3 08:42:49.216 LSM Head: P2MP Provision      00000001, 00000000 -  -
    Dec  3 08:42:50.240 LSM Head: MTE updated         00000001, 00000070 -  -
    Dec  3 08:42:50.240 LSM Head: send PMSI           00000480, 00002710 -  -
    Dec  3 08:43:51.680 BD VPN Add                    00000000, 00000000 -  -
    Dec  3 08:44:59.776 LSM Tail: PMSI received       0100a8c0, 00002710 -  -
    Dec  3 08:45:00.288 LSM Head: MTE updated         00000001, 00000000 -  -
  ------------------------------------------------------------------------------
[...]
```

- Cada roteador é um começo e fim LS e deve enviar o PMSI e receber PMSIs de cada um do outro Roteadores. O primeiro roteador verificado deve receber PMSIs de cada um dos outros Nós.

- O banco de informação de encaminhamento da camada dois (L2FIB) deve receber a informação PRINCIPAL do L2VPN e deve transferi-los à placa de linha.

```
RP/0/RSP0/CPU0:PE1#show l2vpn forwarding bridge-domain detail location 0/1/CPU0

Bridge-domain name: bg1:bg1_bd1, id: 0, state: up
 MAC learning: enabled
MAC port down flush: enabled
Flooding:
  Broadcast & Multicast: enabled
  Unknown unicast: enabled
 MAC aging time: 300 s, Type: inactivity
 MAC limit: 4000, Action: none, Notification: syslog
MAC limit reached: no
 MAC Secure: disabled, Logging: disabled
DHCPv4 snooping: profile not known on this node
 Dynamic ARP Inspection: disabled, Logging: disabled
 IP Source Guard: disabled, Logging: disabled
IGMP snooping: disabled, flooding: enabled
 MLD snooping: disabled, flooding: disabled
 Storm control: disabled
 P2MP PW: enabled
 Ptree type: RSVP-TE, TE i/f: tunnel-mte100,
 nhop valid: TRUE, Status: Bound, Label: 289994
 Bridge MTU: 1500 bytes
 Number of bridge ports: 4
 Number of MAC addresses: 0
 Multi-spanning tree instance: 0
```

- L2FIB deve receber a informação do TAIL do L2VPN para cada picowatt e deve transferi-los à plataforma.

```
RP/0/RSP0/CPU0:PE1#show l2vpn forwarding bridge-domain  hardware ingress detail
location 0/1/CPU0

Bridge-domain name: bg1:bg1_bd1, id: 0, state: up
 MAC learning: enabled
 MAC port down flush: enabled
 Flooding:
  Broadcast & Multicast: enabled
  Unknown unicast: enabled
 MAC aging time: 300 s, Type: inactivity
 MAC limit: 4000, Action: none, Notification: syslog
 MAC limit reached: no
 MAC Secure: disabled, Logging: disabled
 DHCPv4 snooping: profile not known on this node
```

```
 Dynamic ARP Inspection: disabled, Logging: disabled
 IP Source Guard: disabled, Logging: disabled
 IGMP snooping: disabled, flooding: enabled
 MLD snooping: disabled, flooding: disabled
 Storm control: disabled
 P2MP PW: enabled
 Ptree type: RSVP-TE, TE i/f: tunnel-mte100,
            nhop valid: TRUE, Status: Bound, Label: 289994
 Bridge MTU: 1500 bytes
 Number of bridge ports: 4
 Number of MAC addresses: 0
 Multi-spanning tree instance: 0

 Platform Bridge context:
   Last notification sent at: 02/18/2014 21:58:55
   Ingress Bridge Domain: 0, State: Created
   static MACs: 0, port level static MACs: 0, MAC limit: 4000, current MAC limit:
4000,    MTU: 1500, MAC limit action: 0
   Rack 0 FGIDs:shg0: 0x00000000, shg1: 0x00000002, shg2: 0x00000002
   Rack 1 FGIDs:shg0: 0x00000000, shg1: 0x00000000, shg2: 0x00000000
     Flags: Virtual Table ID Disable, P2MP Enable, CorePW Attach
     P2MP Head-end Info: Head end bound
     Tunnel ifhandle: 0x08000e20, Internal Label: 289994, Local LC NP mask: 0x0,
       Head-end Local LC NP mask: 0x0, All L2 Mcast routes local LC NP mask: 0x0
   Rack: 0, Physical slot: 1, shg 0 members: 1, shg 1 members: 0, shg 2 members: 0


 Platform Bridge HAL context:
   Number of NPs: 4, NP mask: 0x0008, mgid index: 513, learn key: 0
   NP: 3, shg 0 members: 1, shg 1 members: 0, shg 2 members: 0
   MAC limit counter index: 0x00ec1e60

   Platform Bridge Domain Hardware Information:
     Bridge Domain: 0 NP 0
       Flags: Virtual Table, Learn Enable, P2MP Tree Enabled
       Head-end P-Tree Int Label: 289994
       Num Members: 0, Learn Key: 0x00, Half Age: 5
       fgid shg0: 0x0000, fgid shg1: 0x0002, fgid shg2: 0x0002, mgid index: 513
       BD learn cntr: 0x00ec1e60
     Bridge Domain: 0 NP 1
       Flags: Virtual Table, Learn Enable, P2MP Tree Enabled
       Head-end P-Tree Int Label: 289994
       Num Members: 0, Learn Key: 0x00, Half Age: 5
       fgid shg0: 0x0000, fgid shg1: 0x0002, fgid shg2: 0x0002, mgid index: 513
       BD learn cntr: 0x00ec1e60
     Bridge Domain: 0 NP 2
       Flags: Virtual Table, Learn Enable, P2MP Tree Enabled
       Head-end P-Tree Int Label: 289994
       Num Members: 0, Learn Key: 0x00, Half Age: 5
       fgid shg0: 0x0000, fgid shg1: 0x0002, fgid shg2: 0x0002, mgid index: 513
       BD learn cntr: 0x00ec1e60
     Bridge Domain: 0 NP 3
       Flags: Virtual Table, Learn Enable, P2MP Tree Enabled
       Head-end P-Tree Int Label: 289994
       Num Members: 1, Learn Key: 0x00, Half Age: 5
       fgid shg0: 0x0000, fgid shg1: 0x0002, fgid shg2: 0x0002, mgid index: 513
       BD learn cntr: 0x00ec1e60
       Bridge Member 0, copy 0
         Flags: Active, XID: 0x06c002a7
       Bridge Member 0, copy 1
         Flags: Active, XID: 0x06c002a7


 GigabitEthernet0/1/1/10.1, state: oper up
```

```
  Number of MAC: 0
  Statistics:
    packets: received 0, sent 0
    bytes: received 0, sent 0
  Storm control drop counters:
    packets: broadcast 0, multicast 0, unknown unicast 0
    bytes: broadcast 0, multicast 0, unknown unicast 0
  Dynamic arp inspection drop counters:
    packets: 0, bytes: 0
  IP source guard drop counters:
    packets: 0, bytes: 0
Platform Bridge Port context:
Last notification sent at: 02/18/2014 21:58:56
Ingress State: Bound
  Flags: None

Platform AC context:
Ingress AC: VPLS, State: Bound
  Flags: Port Level MAC Limit
XID: 0x06c002a7, SHG: None
uIDB: 0x001a, NP: 3, Port Learn Key: 0
Slot flood mask rack 0: 0x200000 rack 1: 0x0 NP flood mask: 0x0008
NP3
  Ingress uIDB:
    Flags: L2, Status, Racetrack Eligible, VPLS
    Stats Ptr: 0x5302c9, uIDB index: 0x001a, Wire Exp Tag: 1
    BVI Bridge Domain: 0, BVI Source XID: 0x00000000
    VLAN1: 0, VLAN1 etype: 0x0000, VLAN2: 0, VLAN2 etype: 0x0000
    L2 ACL Format: 0, L2 ACL ID: 0, IPV4 ACL ID: 0, IPV6 ACL ID: 0
    QOS ID: 0, QOS Format ID: 0
    Local Switch dest XID: 0x06c002a7
    UIDB IF Handle: 0x02001042, Source Port: 0, Num VLANs: 0
  Xconnect ID: 0x06c002a7, NP: 3
    Type: AC
    Flags: Learn enable, VPLS
    uIDB Index: 0x001a
    Bridge Domain ID: 0, Stats Pointer: 0xec1e62
    Split Horizon Group: None
  Bridge Port     :  Bridge 0 Port 0
    Flags: Active Member
    XID: 0x06c002a7
  Bridge Port Virt:  Bridge 0 Port 0
    Flags: Active Member
    XID: 0x06c002a7
  Storm Control not enabled

Nbor 209.165.200.226 pw-id 1
  Number of MAC: 0
  Statistics:
    packets: received 0, sent 2
    bytes: received 0, sent 192
  Storm control drop counters:
    packets: broadcast 2, multicast 0, unknown unicast 0
    bytes: broadcast 192, multicast 0, unknown unicast 0
  Dynamic arp inspection drop counters:
    packets: 0, bytes: 0
  IP source guard drop counters:
    packets: 0, bytes: 0
  Statistics P2MP:
    packets: received 0
    bytes: received 0

Platform Bridge Port context:
Last notification sent at: 02/18/2014 21:58:55
```

```
 Ingress State: Bound
   Flags: None
   P2MP PW enabled, P2MP Role: tail
  Platform PW context:
  Ingress PW: VPLS, State: Bound
 XID: 0xc0008000, bridge: 0, MAC limit: 4000, l2vpn ldi index: 0x0001, vc label:
16030,  nr_ldi_hash: 0xab, r_ldi_hash: 0xbd, lag_hash: 0x17, SHG: VFI Enabled
   Flags: MAC Limit Port Level
 Port Learn Key: 0
 Trident Layer Flags: None
 Slot flood mask rack 0: 0x0 rack 1: 0x0 NP flood mask: 0x0000
 Primary L3 path: ifhandle: 0x02000100, sfp_or_lagid: 0x00d2
 Backup L3 path: Not set
 NP0
   Xconnect ID: 0xc0008000, NP: 0
     Type: Pseudowire (no control word)
     Flags: Learn enable, Type 5, Local replication, VPLS
     VC label hash, nR-LDI Hash: 0xab, R-LDI Hash: 0xb7, LAG Hash: 0x17,
     VC output label: 0x03e9e (16030), LDI: 0x0001, stats ptr: 0x00530258
     Bridge Domain ID: 0, Stats Pointer: 0xec1e62
     Split Horizon Group: VFI Enabled
 NP1
   Xconnect ID: 0xc0008000, NP: 1
     Type: Pseudowire (no control word)
     Flags: Learn enable, Type 5, Local replication, VPLS
     VC label hash, nR-LDI Hash: 0xab, R-LDI Hash: 0xb7, LAG Hash: 0x17,
     VC output label: 0x03e9e (16030), LDI: 0x0001, stats ptr: 0x00530258
     Bridge Domain ID: 0, Stats Pointer: 0xec1e62
     Split Horizon Group: VFI Enabled
 NP2
   Xconnect ID: 0xc0008000, NP: 2
     Type: Pseudowire (no control word)
     Flags: Learn enable, Type 5, Local replication, VPLS
     VC label hash, nR-LDI Hash: 0xab, R-LDI Hash: 0xb7, LAG Hash: 0x17,
     VC output label: 0x03e9e (16030), LDI: 0x0001, stats ptr: 0x00530300
     Bridge Domain ID: 0, Stats Pointer: 0xec1e62
     Split Horizon Group: VFI Enabled
 NP3
   Xconnect ID: 0xc0008000, NP: 3
     Type: Pseudowire (no control word)
     Flags: Learn enable, Type 5, Local replication, VPLS
     VC label hash, nR-LDI Hash: 0xab, R-LDI Hash: 0xb7, LAG Hash: 0x17,
     VC output label: 0x03e9e (16030), LDI: 0x0001, stats ptr: 0x00530488
     Bridge Domain ID: 0, Stats Pointer: 0xec1e64
     Split Horizon Group: VFI Enabled

 Nbor 209.165.200.227 pw-id 1
   Number of MAC: 0
   Statistics:
     packets: received 0, sent 1
     bytes: received 0, sent 96
   Storm control drop counters:
     packets: broadcast 0, multicast 0, unknown unicast 0
     bytes: broadcast 0, multicast 0, unknown unicast 0
   Dynamic arp inspection drop counters:
     packets: 0, bytes: 0
   IP source guard drop counters:
     packets: 0, bytes: 0
   Statistics P2MP:
     packets: received 0
     bytes: received 0

 Platform Bridge Port context:
 Last notification sent at: 02/18/2014 21:58:55
```

```
 Ingress State: Bound
   Flags: None
   P2MP PW enabled, P2MP Role: tail
  Platform PW context:
  Ingress PW: VPLS, State: Bound
 XID: 0xc0008001, bridge: 0, MAC limit: 4000, l2vpn ldi index: 0x0002, vc label:
16030,  nr_ldi_hash: 0xab, r_ldi_hash: 0xbd, lag_hash: 0x17, SHG: VFI Enabled
   Flags: MAC Limit Port Level
 Port Learn Key: 0
 Trident Layer Flags: None
 Slot flood mask rack 0: 0x0 rack 1: 0x0 NP flood mask: 0x0000
 Primary L3 path: ifhandle: 0x02000100, sfp_or_lagid: 0x00d2
 Backup L3 path: Not set
 NP0
   Xconnect ID: 0xc0008001, NP: 0
     Type: Pseudowire (no control word)
     Flags: Learn enable, Type 5, Local replication, VPLS
     VC label hash, nR-LDI Hash: 0xab, R-LDI Hash: 0xb7, LAG Hash: 0x17,
     VC output label: 0x03e9e (16030), LDI: 0x0002, stats ptr: 0x0053025e
     Bridge Domain ID: 0, Stats Pointer: 0xec1e64
     Split Horizon Group: VFI Enabled
 NP1
   Xconnect ID: 0xc0008001, NP: 1
     Type: Pseudowire (no control word)
     Flags: Learn enable, Type 5, Local replication, VPLS
     VC label hash, nR-LDI Hash: 0xab, R-LDI Hash: 0xb7, LAG Hash: 0x17,
     VC output label: 0x03e9e (16030), LDI: 0x0002, stats ptr: 0x0053025e
     Bridge Domain ID: 0, Stats Pointer: 0xec1e64
     Split Horizon Group: VFI Enabled
 NP2
   Xconnect ID: 0xc0008001, NP: 2
     Type: Pseudowire (no control word)
     Flags: Learn enable, Type 5, Local replication, VPLS
     VC label hash, nR-LDI Hash: 0xab, R-LDI Hash: 0xb7, LAG Hash: 0x17,
     VC output label: 0x03e9e (16030), LDI: 0x0002, stats ptr: 0x00530306
     Bridge Domain ID: 0, Stats Pointer: 0xec1e64
     Split Horizon Group: VFI Enabled
 NP3
   Xconnect ID: 0xc0008001, NP: 3
     Type: Pseudowire (no control word)
     Flags: Learn enable, Type 5, Local replication, VPLS
     VC label hash, nR-LDI Hash: 0xab, R-LDI Hash: 0xb7, LAG Hash: 0x17,
     VC output label: 0x03e9e (16030), LDI: 0x0002, stats ptr: 0x0053048e
     Bridge Domain ID: 0, Stats Pointer: 0xec1e66
     Split Horizon Group: VFI Enabled

 Nbor 209.165.200.228 pw-id 1
   Number of MAC: 0
   Statistics:
     packets: received 0, sent 0
     bytes: received 0, sent 0
   Storm control drop counters:
     packets: broadcast 0, multicast 0, unknown unicast 0
     bytes: broadcast 0, multicast 0, unknown unicast 0
   Dynamic arp inspection drop counters:
     packets: 0, bytes: 0
   IP source guard drop counters:
     packets: 0, bytes: 0
   Statistics P2MP:
     packets: received 0
     bytes: received 0

 Platform Bridge Port context:
 Last notification sent at: 02/18/2014 21:58:55
```

```
 Ingress State: Bound
   Flags: None
   P2MP PW enabled, P2MP Role: tail
  Platform PW context:
  Ingress PW: VPLS, State: Bound
 XID: 0xc0008002, bridge: 0, MAC limit: 4000, l2vpn ldi index: 0x0003, vc label:
16045,  nr_ldi_hash: 0x7b, r_ldi_hash: 0xb3, lag_hash: 0xa8, SHG: VFI Enabled
   Flags: MAC Limit Port Level
 Port Learn Key: 0
 Trident Layer Flags: None
 Slot flood mask rack 0: 0x0 rack 1: 0x0 NP flood mask: 0x0000
 Primary L3 path: ifhandle: 0x02000100, sfp_or_lagid: 0x00d2
 Backup L3 path: Not set
 NP0
   Xconnect ID: 0xc0008002, NP: 0
     Type: Pseudowire (no control word)
     Flags: Learn enable, Type 5, Local replication, VPLS
     VC label hash, nR-LDI Hash: 0x7b, R-LDI Hash: 0xd6, LAG Hash: 0xa8,
     VC output label: 0x03ead (16045), LDI: 0x0003, stats ptr: 0x00530264
     Bridge Domain ID: 0, Stats Pointer: 0xec1e66
     Split Horizon Group: VFI Enabled
 NP1
   Xconnect ID: 0xc0008002, NP: 1
     Type: Pseudowire (no control word)
     Flags: Learn enable, Type 5, Local replication, VPLS
     VC label hash, nR-LDI Hash: 0x7b, R-LDI Hash: 0xd6, LAG Hash: 0xa8,
     VC output label: 0x03ead (16045), LDI: 0x0003, stats ptr: 0x00530264
     Bridge Domain ID: 0, Stats Pointer: 0xec1e66
     Split Horizon Group: VFI Enabled
 NP2
   Xconnect ID: 0xc0008002, NP: 2
     Type: Pseudowire (no control word)
     Flags: Learn enable, Type 5, Local replication, VPLS
     VC label hash, nR-LDI Hash: 0x7b, R-LDI Hash: 0xd6, LAG Hash: 0xa8,
     VC output label: 0x03ead (16045), LDI: 0x0003, stats ptr: 0x0053030c
     Bridge Domain ID: 0, Stats Pointer: 0xec1e66
     Split Horizon Group: VFI Enabled
 NP3
   Xconnect ID: 0xc0008002, NP: 3
     Type: Pseudowire (no control word)
     Flags: Learn enable, Type 5, Local replication, VPLS
     VC label hash, nR-LDI Hash: 0x7b, R-LDI Hash: 0xd6, LAG Hash: 0xa8,
     VC output label: 0x03ead (16045), LDI: 0x0003, stats ptr: 0x00530494
     Bridge Domain ID: 0, Stats Pointer: 0xec1e68
     Split Horizon Group: VFI Enabled

RP/0/RSP0/CPU0:PE1#
```