



# APPENDIX **A**

## Sample Configlets

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This appendix provides sample configlets for MPLS VPN provisioning in ISC. It contains the following sections:

- [Overview, page A-1](#)
- [L2 Access into L3 MPLS VPN, page A-3](#)
- [CE-PE L3 MPLS VPN \(BGP with full-mesh\), page A-5](#)
- [CE-PE L3 MPLS VPN \(BGP with SOO\), page A-6](#)
- [CE-PE L3 MPLS VPN, page A-7](#)
- [N-PE L3 MPLS VPN \(IPv4, IOS XR, OSPF\), page A-8](#)
- [N-PE L3 MPLS VPN \(IPv6, IOS XR, EIGRP\), page A-12](#)
- [CE-PE L3 MPLS VPN \(Q-in-Q/Second VLAN ID\), page A-16](#)

## Overview

The configlets provided in this appendix show the CLIs generated by ISC for particular services and features. Each configlet example provides the following information:

- Service.
- Feature.
- Devices configuration (network role, hardware platform, relationship of the devices and other relevant information).
- Sample configlets for each device in the configuration.
- Comments.



**Note**

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The configlets generated by ISC are only the delta between what needs to be provisioned and what currently exists on the device. This means that if a relevant CLI is already on the device, it does not show up in the associated configlet.

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**Note**

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All examples in this appendix assume an MPLS core.

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For information on how to view configlets, see [Viewing Configlets Generated by a Service Request](#), page 6-31.

# L2 Access into L3 MPLS VPN

## Configuration

- Service: L2VPN/Metro Ethernet.
- Feature: Access into L3 MPLS VPN.
- Device configuration:
  - The CE is a Cisco 3550 with IOS 12.1(22)EA1.  
Interface(s): F0/13 <-> F0/4.
  - The U-PE is a Cisco 3550 with IOS 12.1(22)EA1.  
Interface(s): F0/14.
  - The N-PE is a Cisco 7609 with IOS 12.2(18)SXF.  
Interface(s): F2/8.
  - VLAN = 3101.

## Configlets

CE	U-PE	N-PE
<pre>! vlan 3101 exit ! interface FastEthernet0/13 no ip address switchport switchport trunk encapsulation dot1q switchport mode trunk switchport trunk allowed vlan 1,3101 ! interface Vlan3101 description By VPNSC: Job Id# = 13 ip address 10.19.19.10 255.255.255.252 no shutdown</pre>	<pre>! vlan 3101 exit ! interface FastEthernet0/14 no ip address switchport switchport trunk encapsulation dot1q switchport mode trunk switchport trunk allowed vlan 1,3101 ! interface FastEthernet0/4 no keepalive no ip address switchport switchport trunk encapsulation dot1q switchport mode trunk switchport trunk allowed vlan 3101 switchport nonegotiate cdp enable no shutdown mac access-group ISC-FastEthernet0/4 in ! mac access-list extended ISC-FastEthernet0/4 deny any host 0100.0ccc.cccc deny any host 0100.0ccc.cccd deny any host 0100.0ccd.cdd0 deny any host 0180.c200.0000 permit any any</pre>	<pre>! ip vrf V5:VPN_sample rd 100:1502 route-target import 100:1602 route-target import 100:1603 route-target export 100:1602 maximum routes 100 80 ! interface FastEthernet2/8 no shutdown ! interface FastEthernet2/8.3101 description FastEthernet2/8.3101 dot1q vlan id=3101. By VPNSC: Job Id# = 13 encapsulation dot1Q 3101 ip vrf forwarding V5:VPN_sample ip address 10.19.19.9 255.255.255.252 no shutdown ! router bgp 100 address-family ipv4 vrf V5:VPN_sample redistribute connected redistribute static exit-address-family</pre>

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**Comments**

- IP Numbered scenario with Dot1q encapsulation for VPN Link.
- The VRF is created on the N-PE device (-s designates that the VRF is joining the VPN as a spoke in a hub-n-spoke topology).
- On the N-PE, the VRF is added to iBGP routing instance with user configured redistribution of connected and static options.
- The VRF is created on the NPE with forwarding associated with the U-PE facing interface.

## CE-PE L3 MPLS VPN (BGP with full-mesh)

### Configuration

- Service: L3 MPLS VPN.
- Feature: CE-PE BGP with full-mesh.
- Device configuration:
  - The PE is a Cisco 7609 with IOS 12.2(18)SXF.  
Interface(s): F2/5.
  - The CE is a Cisco 3550 with IOS 12.2(22)EA1.  
Interface(s): F0/13.
  - Routing protocol = BGP.

### Configlets

CE	PE
<pre>! vlan 62 exit ! interface FastEthernet0/13 no ip address switchport switchport trunk encapsulation dot1q switchport mode trunk switchport trunk allowed vlan 62 ! interface Vlan62 description By VPNSC: Job Id# = 29 ip address 10.19.19.42 255.255.255.252 no shutdown ! router bgp 10 neighbor 10.19.19.41 remote-as 100</pre>	<pre>! ip vrf V9:mpls_vpn1 rd 100:1506 route-target import 99:3204 route-target export 99:3204 maximum routes 100 80 ! interface FastEthernet2/5.62 description FastEthernet2/5.62 dot1q vlan id=62. By VPNSC: Job Id# = 29 encapsulation dot1Q 62 ip vrf forwarding V9:mpls_vpn1 ip address 10.19.19.41 255.255.255.252 no shutdown ! router bgp 100 address-family ipv4 vrf V9:mpls_vpn1 neighbor 10.19.19.42 remote-as 10 neighbor 10.19.19.42 activate neighbor 10.19.19.42 allowas-in 2 redistribute connected redistribute static exit-address-family</pre>

### Comments

- A full-mesh configuration is created by means of the CERC selected for the VPN policy. As a result, route-target import and route-target export are identical.
- BGP is the routing protocol on the CE-PE access link.
- IP Numbered scenario with dot1q encapsulation for the VPN link.
- The VRF is created on the PE device.
- The VRF is created on the PE with forwarding associated with the CE facing interface.

## CE-PE L3 MPLS VPN (BGP with S00)

### Configuration

- Service: L3 MPLS VPN.
- Feature: CE-PE.
- Device configuration:
  - The PE is a Cisco 7609 with IOS 12.2(18)SXF.  
Interface(s): FE2/3.
  - The CE created in ISC.  
Interface(s): FE1/0/14.
  - Routing protocol = BGP.
  - VPN = hub.

### Configlets

CE	PE
<pre> ! vlan 3100 exit ! interface FastEthernet1/0/14 no ip address switchport switchport trunk encapsulation dot1q switchport mode trunk switchport trunk allowed vlan 1,3100 no shutdown ! interface Vlan3100 description By VPNSC: Job Id# = 12 ip address 10.19.19.6 255.255.255.252 no shutdown ! router ospf 3500 network 10.19.19.4 0.0.0.3 area 12345 </pre>	<pre> ! ip vrf V4:VPN_sample-s rd 100:1501 route-target import 100:1602 route-target export 100:1603 maximum routes 100 80 ! interface FastEthernet2/3.3100 description FastEthernet2/3.3100 dot1q vlan id=3100. By VPNSC: Job Id# = 12 encapsulation dot1Q 3100 ip vrf forwarding V4:VPN_sample-s ip address 10.19.19.5 255.255.255.252 no shutdown ! router ospf 2500 vrf V4:VPN_sample-s redistribute bgp 100 subnets network 10.19.19.4 0.0.0.3 area 12345 ! router bgp 100 address-family ipv4 vrf V4:VPN_sample-s redistribute connected redistribute ospf 2500 vrf V4:VPN_sample-s match internal external 1 external 2 redistribute static exit-address-family </pre>

### Comments

- IP Numbered scenario with dot1q encapsulation for the VPN link.
- The VRF is created on PE device (VPN is joining as a spoke).
- On PE, the VRF is added to iBGP routing instance with user configured redistribution of connected and static options.
- The VRF is created on the PE with forwarding associated with the CE-facing interface.

# CE-PE L3 MPLS VPN

## Configuration

- Service: L3 MPLS VPN.
- Feature: CE-PE.
- Device configuration:
  - The PE is a Cisco 7603 with IOS 12.2(18)SXD7.  
Interface(s): FE2/25.
  - The CE is an Cisco 3750ME-I5-M with IOS 12.2(25)EY2.  
Interface(s): FE1/0/6.
  - VPN = spoke.

## Configlets

CE	PE
<pre>! vlan 890 exit ! interface FastEthernet1/0/6 no ip address switchport trunk encapsulation dot1q switchport mode trunk switchport trunk allowed vlan 890 no shutdown ! interface Vlan890 description By VPNSC: Job Id# = 336 : SR Id# = 336 ip address 10.10.75.2 255.255.255.252 no shutdown ! router bgp 120 neighbor 10.10.75.1 remote-as 100 no auto-summary</pre>	<pre>! ip vrf V60:TestVPN-s rd 100:8069 route-target import 100:1891 route-target export 100:1892 ! interface FastEthernet2/25.890 description FastEthernet2/25.890 dot1q vlan id=890. By VPNSC: Job Id# = 336 : SR Id# = 336 encapsulation dot1Q 890 ip vrf forwarding V60:TestVPN-s ip address 10.10.75.1 255.255.255.252 no shutdown ! router bgp 100 no auto-summary address-family ipv4 vrf V60:TestVPN-s neighbor 10.10.75.2 remote-as 120 neighbor 10.10.75.2 activate neighbor 10.10.75.2 route-map SetSOO_V60:TestVPN-s_100:100 in exit-address-family ! route-map SetSOO_V60:TestVPN-s_100:100 permit 10 set extcommunity soo 100:100</pre>

## Comments

- IP Numbered scenario with dot1q encapsulation for the VPN link.
- The VRF is created on the PE device.
- `neighbor 10.10.75.2 remote-as 120` is created as a result of the policy having the CE BGP AS ID set to 120.
- The VRF is created on the PE with forwarding associated with the CE-facing interface.
- On the PE, BGP defines a route-map for the CE neighbor.
- The associated route map sets the extended community attribute to SOO, which is the community value (SOO pool value defined in ISC).

# N-PE L3 MPLS VPN (IPv4, IOS XR, OSPF)

## Configuration

- Service: L3 MPLS VPN.
- Feature: IPv4 with IOS XR.
- Device configuration:
  - The N-PE is a Cisco 12000 router with IOS XR.
  - Routing protocol = OSPF.

## Configlets

### N-PE

(See the extended code example below.)

```
<?xml version="1.0" encoding="UTF-8"?>
<Request MajorVersion="1" MinorVersion="0">
  <Delete>
    <Configuration Source="CurrentConfig">
      <InterfaceConfigurationTable>
        <InterfaceConfiguration>
          <Naming>
            <Name>GigabitEthernet0/1/1/1.856</Name>
            <Active>act</Active>
          </Naming>
          <Shutdown>>true</Shutdown>
        </InterfaceConfiguration>
      </InterfaceConfigurationTable>
    </Configuration>
  </Delete>
  <Set>
    <Configuration Source="CurrentConfig">
      <VRFTable>
        <VRF>
          <Naming>
            <Name>ICICI_VPN_1</Name>
          </Naming>
          <AFI_SAFITable>
            <AFI_SAFI>
              <Naming>
                <AFI>IPv4</AFI>
                <SAFI>Unicast</SAFI>
              </Naming>
            </AFI_SAFI>
          </AFI_SAFITable>
          <BGP>
            <ImportRouteTargets>
              <RouteTargetTable>
                <RouteTarget>
                  <Naming>
                    <Type>AS</Type>
                    <AS>100</AS>
                    <ASIndex>1</ASIndex>
                  </Naming>
                  <True>true</True>
                </RouteTarget>
              </RouteTargetTable>
            </ImportRouteTargets>
          </BGP>
        </VRF>
      </VRFTable>
    </Configuration>
  </Set>
</Request>
```

```

    <ExportRouteTargets>
      <RouteTargetTable>
        <RouteTarget>
          <Naming>
            <Type>AS</Type>
            <AS>100</AS>
            <ASIndex>1</ASIndex>
          </Naming>
          <True>>true</True>
        </RouteTarget>
      </RouteTargetTable>
    </ExportRouteTargets>
  </BGP>
</AFI_SAFI>
</AFI_SAFITable>
</VRF>
</VRFTable>
<InterfaceConfigurationTable>
  <InterfaceConfiguration>
    <Naming>
      <Name>GigabitEthernet0/1/1/1.856</Name>
      <Active>act</Active>
    </Naming>
    <Description>GigabitEthernet0/1/1/1.856 dot1q vlan id=856. By VPNSC: Job Id# =
116</Description>
    <InterfaceModeNonPhysical>Default</InterfaceModeNonPhysical>
    <VLANSubConfiguration>
      <VLANIdentifier>
        <VlanType>VLANTypeDot1q</VlanType>
        <FirstTag>856</FirstTag>
      </VLANIdentifier>
    </VLANSubConfiguration>
    <VRF>ICICI_VPN_1</VRF>
    <IPV4Network>
      <Addresses>
        <Primary>
          <IPAddress>10.10.56.1</IPAddress>
          <Mask>255.255.255.252</Mask>
        </Primary>
      </Addresses>
    </IPV4Network>
  </InterfaceConfiguration>
</InterfaceConfigurationTable>
<BGP>
  <AS>
    <Naming>
      <AS>0</AS>
    </Naming>
    <FourByteAS>
      <Naming>
        <AS>100</AS>
      </Naming>
    </FourByteAS>
  </AS>
  <VRFTable>
    <VRF>
      <Naming>
        <Name>ICICI_VPN_1</Name>
      </Naming>
      <VRFGlobal>
        <Exists>true</Exists>
        <RouteDistinguisher>
          <Type>AS</Type>
          <AS>100</AS>
          <ASIndex>8064</ASIndex>
        </RouteDistinguisher>
      </VRFGlobal>
    </VRF>
  </VRFTable>

```

```

    <VRFGlobalAFTable>
      <VRFGlobalAF>
        <Naming>
          <AF>IPv4Unicast</AF>
        </Naming>
        <Enabled>>true</Enabled>
        <Redistribution>
          <ConnectedRoutes/>
          <OSPFRouteTable>
            <OSPFRoutes>
              <Naming>
                <OSPFInstanceName>100</OSPFInstanceName>
              </Naming>
              <RedistType>21</RedistType>
              <DefaultMetric>20000</DefaultMetric>
            </OSPFRoutes>
          </OSPFRouteTable>
          <StaticRoutes/>
        </Redistribution>
      </VRFGlobalAF>
    </VRFGlobalAFTable>
  </VRFGlobal>
</VRF>
</VRFTable>
</FourByteAS>
</AS>
</BGP>
<OSPF>
  <ProcessTable>
    <Process>
      <Naming>
        <InstanceName>100</InstanceName>
      </Naming>
      <Start>true</Start>
      <VRFTable>
        <VRF>
          <Naming>
            <VRFName>ICICI_VPN_1</VRFName>
          </Naming>
          <VRFStart>true</VRFStart>
          <Redistribution>
            <RedistributeTable>
              <Redistribute>
                <Naming>
                  <ProtocolType>rip</ProtocolType>
                  <InstanceName>rip</InstanceName>
                </Naming>
                <Classful>>false</Classful>
              </Redistribute>
              <Redistribute>
                <Naming>
                  <ProtocolType>static</ProtocolType>
                  <InstanceName>static</InstanceName>
                </Naming>
                <Classful>>false</Classful>
              </Redistribute>
            </RedistributeTable>
          </Redistribution>
        </VRF>
      </VRFTable>
    </Process>
  </ProcessTable>
  <AreaTable>
    <Area>
      <Naming>
        <IntegerID>100</IntegerID>
      </Naming>
      <NameScopeTable>

```

```

        <NameScope>
          <Naming>
            <Interface>GigabitEthernet0/1/1/1.856</Interface>
          </Naming>
          <Running>true</Running>
        </NameScope>
      </NameScopeTable>
      <Running>true</Running>
    </Area>
  </AreaTable>
  <DefaultInformation>
    <AlwaysAdvertise>true</AlwaysAdvertise>
  </DefaultInformation>
</VRF>
</VRFTable>
</Process>
</ProcessTable>
</OSPF>
</Configuration>
</Set>
<Commit/>
</Request>

```

---

**Comments**

- In IOS XR, device configuration is specified in XML format.
- With respect to the XML schemas, different versions of IOS XR will generate different XML configlets. However the configurations will be almost identical, except for changes in the XML schema.
- There are different cases to consider. For example, when a service request is decommissioned or modified, the XML configuration will slightly differ.

# N-PE L3 MPLS VPN (IPv6, IOS XR, EIGRP)

## Configuration

- Service: L3 MPLS VPN.
- Feature: N-PE running IOS XR 3.5.x.
- Device configuration:
  - The N-PE is a Cisco 12000 router with IOS XR 3.5.x.
  - Routing protocol = EIGRP.

## Configlets

### N-PE

(See the extended code example below.)

```
<?xml version="1.0" encoding="UTF-8"?>
<Request MajorVersion="1" MinorVersion="0">
  <CLI>
<Configuration>
interface GigabitEthernet0/1/1/1.840

ipv6 address fec0:140:9834::/64

exit

</Configuration>
</CLI>
<Delete>
  <Configuration Source="CurrentConfig">
    <EIGRP>
      <ProcessTable>
        <Process>
          <Naming>
            <ASNumber>100</ASNumber>
          </Naming>
          <VRFTable>
            <VRF>
              <Naming>
                <VRFName>V10:ICICI_VPN</VRFName>
              </Naming>
              <VRF_AFTable>
                <VRF_AF>
                  <Naming>
                    <VRF_AFType>IPv4</VRF_AFType>
                  </Naming>
                  <AutoSummary/>
                </VRF_AF>
              </VRF_AFTable>
            </VRF>
          </VRFTable>
        </Process>
      </ProcessTable>
    </EIGRP>
    <InterfaceConfigurationTable>
      <InterfaceConfiguration>
        <Naming>
```

```

        <Name>GigabitEthernet0/1/1/1.840</Name>
        <Active>act</Active>
    </Naming>
    <Shutdown>>true</Shutdown>
</InterfaceConfiguration>
</InterfaceConfigurationTable>
</Configuration>
</Delete>
<Set>
    <Configuration Source="CurrentConfig">
        <InterfaceConfigurationTable>
            <InterfaceConfiguration>
                <Naming>
                    <Name>GigabitEthernet0/1/1/1.840</Name>
                    <Active>act</Active>
                </Naming>
                <Description>GigabitEthernet0/1/1/1.840 dot1q vlan id=840. By VPNSC: Job Id# =
50</Description>
                <InterfaceModeNonPhysical>Default</InterfaceModeNonPhysical>
            <VLANSubConfiguration>
                <VLANIdentifier>
                    <VlanType>VLANTypeDot1q</VlanType>
                    <FirstTag>840</FirstTag>
                </VLANIdentifier>
            </VLANSubConfiguration>
            <VRF>V10:ICICI_VPN</VRF>
        </InterfaceConfiguration>
    </InterfaceConfigurationTable>
    <BGP>
        <AS>
            <Naming>
                <AS>0</AS>
            </Naming>
            <FourByteAS>
                <Naming>
                    <AS>100</AS>
                </Naming>
            <VRFTable>
                <VRF>
                    <Naming>
                        <Name>V10:ICICI_VPN</Name>
                    </Naming>
                    <VRFGlobal>
                        <Exists>true</Exists>
                        <VRFGlobalAFTable>
                            <VRFGlobalAF>
                                <Naming>
                                    <AF>IPv6Unicast</AF>
                                </Naming>
                                <Enabled>true</Enabled>
                                <Redistribution>
                                    <EIGRPRouteTable>
                                        <EIGRPRoutes>
                                            <Naming>
                                                <EIGRPInstanceName>120</EIGRPInstanceName>
                                            </Naming>
                                        </EIGRPRoutes>
                                    </EIGRPRouteTable>
                                </Redistribution>
                            </VRFGlobalAF>
                        </VRFGlobalAFTable>
                    </VRFGlobal>
                </VRF>
            </VRFTable>
        </AS>
    </BGP>

```

```

    </FourByteAS>
  </AS>
</BGP>
<EIGRP>
  <ProcessTable>
    <Process>
      <Naming>
        <ASNumber>100</ASNumber>
      </Naming>
      <VRFTable>
        <VRF>
          <Naming>
            <VRFName>V10:ICICI_VPN</VRFName>
          </Naming>
          <Enabled>true</Enabled>
          <VRF_AFTable>
            <VRF_AF>
              <Naming>
                <VRF_AFType>IPv4</VRF_AFType>
              </Naming>
              <Enabled>true</Enabled>
              <RedistributeTable>
                <Redistribute>
                  <Naming>
                    <Protocol>BGP</Protocol>
                    <SecondASNumber>100</SecondASNumber>
                  </Naming>
                  <PolicySpecified>>false</PolicySpecified>
                </Redistribute>
              </RedistributeTable>
              <DefaultMetric>
                <BW>2000</BW>
                <Delay>2001</Delay>
                <Reliability>200</Reliability>
                <Load>201</Load>
                <MTU>20000</MTU>
              </DefaultMetric>
              <InterfaceTable>
                <Interface>
                  <Naming>
                    <InterfaceName>GigabitEthernet0/1/1/1.840</InterfaceName>
                  </Naming>
                  <Enabled>true</Enabled>
                </Interface>
              </InterfaceTable>
              <AutonomousSystem>120</AutonomousSystem>
            </VRF_AF>
          </VRF_AFTable>
        </VRF>
      </VRFTable>
    </Process>
  </ProcessTable>
</EIGRP>
</Configuration>
</Set>
<Commit/>
</Request>Comments

```

- In IOS XR, device configuration is specified in XML format.
- With respect to the XML schemas, different versions of IOS XR will generate different XML configlets. However the configurations will be almost identical, except for changes in the XML schema.

- There are different cases to consider. For example, when a service request is decommissioned or modified, the XML configuration will slightly differ.

## CE-PE L3 MPLS VPN (Q-in-Q/Second VLAN ID)

### Configuration

- Service: L3 MPLS VPN.
- Feature: CE-PE. Q-in-Q (second VLAN ID) is configured on the PE.
- Device configuration:
  - The N-PE is a Cisco 7606-S with IOS 12.2(33)SRC, and with an ES20 line card.  
Interface(s): GE2/0/15.
  - The CE is a Cisco 2811.  
Interface(s): FE0/0.
  - VPN = spoke.

### Configlets

CE	N-PE
<pre>! interface FastEthernet0/0.158 description FastEthernet0/0.158 dot1q vlan id=158. By VPNSC: Job Id# = 239 encapsulation dot1q 158 ip address 10.1.1.98 255.255.255.252 no shutdown ! ip route 0.0.0.0 0.0.0.0 FastEthernet0/0.158</pre>	<pre>! ip vrf V15:MPLS-1 rd 100:6812 route-target import 100:7000 route-target import 100:7001 route-target export 100:7000 ! interface GigabitEthernet2/0/15.158 description GigabitEthernet2/0/15.158 dot1q vlan id=158. By VPNSC: Job Id# = 239 encapsulation dot1q 158 second-dot1q 1502 ip vrf forwarding V15:MPLS-1 ip address 10.1.1.97 255.255.255.252 no shutdown ! router bgp 100 address-family ipv4 vrf V15:MPLS-1 redistribute connected redistribute static exit-address-family</pre>

### Comments

- Encapsulation must be dot1q; SVI disabled.
- IOS support only. There is no Q-in-Q support for IOS XR.
- The resulting CLI configuration command is:
 

```
encapsulation dot1q <VID-1> second-dot1q <VID-2>
```

  - *VID-1* can be assigned by ISC VLAN ID resource pools, or manually.
  - *VID-2* must be added manually. There is no support for autopick ID for the second VLAN ID.
- Platforms/IOS versions which support the command include, but are not limited to:
  - Cisco 7600/SRBx with ES-20, SIP400 + 2, and 5-port GE-V2 SPA.
  - Cisco 7600/SRCx ES-20, SIP400 + 2, 5-port GE-V2 SPA, and 10GE-V2 SPA.
  - Cisco 7200 NPE-G1 with IOS 12.4 mainline.

- Cisco 7200 NPE-G2 with IOS 12.4(4)XD.
- There is a new template variable for second VLAN ID: `$Second_PE_Vlan_ID`.
- Network configurations supported include:
  - PE only.
  - PE-CE with managed and unmanaged CEs.



---

**Note** SecondVLAN ID is configured on the PE only, not the CE.

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For additional coverage of Q-in-Q support in ISC, see the coverage of the Second VLAN ID attribute in the section [Creating an MPLS VPN PE-CE Service Request, page 6-7](#).

