

Chapter 15

VPLS Configuration Guidelines

Virtual private LAN service (VPLS) allows you to provide a point-to-multipoint LAN between a set of sites in a VPN.

To configure VPLS functionality, you must enable VPLS support on the provider edge (PE) router. You must also configure PE routers to distribute routing information to the other PE routers in the VPLS and configure the circuits between the PE routers and the customer edge (CE) routers.

Each VPLS is configured under a routing instance of type `vpls`. A `vpls` routing instance can transparently carry Ethernet traffic across the service provider's network. As with other routing instances, all logical interfaces belonging to a VPLS routing instance are listed under that instance.



Note

For VPLS to function, the PE router must have a Tunnel Services PIC.

To configure VPLS, you include statements at the [edit routing-instances *routing-instance-name*] hierarchy level:

```
[edit]
routing-instances {
  routing-instance-name {
    description text;
    instance-type vpls;
    interface interface-name;
    route-distinguisher (as-number:id | ip-address:id);
    vrf-export [ policy-names ];
    vrf-import [ policy-names ];
    vrf-target target:target-id;
    protocols {
      vpls {
        site site-name {
          site-identifier identifier;
        }
        site-range number;
        traceoptions {
          file filename <replace> <size size> <files number> <nostamp>;
          flag flag <flag-modifier> <disable>;
        }
      }
    }
  }
}
```

For VPLS, only some of the statements in the [edit routing-instances] hierarchy are valid. For the full hierarchy, see the *JUNOS Internet Software Configuration Guide: Routing and Routing Protocols*.

In addition to these statements, you must configure Multiprotocol Label Switching (MPLS) label-switched paths (LSPs) between the PE routers, internal border gateway protocol (IBGP) sessions between the PE routers, and an interior gateway protocol (IGP) on the PE and provider routers.

By default, VPLS is disabled.

Many configuration procedures for VPLS are identical to the procedures for Layer 2 VPNs and Layer 3 VPNs. These procedures are described in detail in Chapter 2, “VPN Configuration Guidelines” on page 9 and include the following:

Enable a Signaling Protocol on the PE Routers

Configure an IGP on the PE and Provider Routers on page 13

Configure an IBGP Session between PE Routers on page 14

Configure a VPN Routing Instance on the PE Routers

The following sections describe the procedures specific to configuring VPLS:

Configure Interfaces for VPLS Routing on page 285

Configure the VPLS Site on page 288

Configure the Site Range on page 288

Configure an Ethernet Switch as the CE Device on page 288

Map VPLS Traffic to a Specific LSP on page 289

Trace VPLS Traffic and Operations on page 290

Configure Interfaces for VPLS Routing

On each PE router and for each VPLS routing instance, specify which interfaces are intended for the VPLS traffic traveling between PE and CE routers by including the interface statement at the [edit routing-instances *routing-instance-name*] hierarchy level:

```
[edit routing-instances routing-instance-name]
interface interface-name;
```

You must also configure each interface at the [edit interfaces *interface-name*] hierarchy level:

```
[edit]
interfaces {
  interface-name {
    vlan-tagging;
    encapsulation encapsulation-type;
    unit unit-number {
      vlan-id vlan-id-number;
      family vpls;
    }
  }
}
```

The following sections provide enough information to configure interfaces for VPLS routing. For detailed information on configuring interfaces and the statements at the [edit interfaces] hierarchy level, see the *JUNOS Internet Software Configuration Guide: Network Network Interfaces and Class of Service*.

To configure an interface for VPLS, complete the procedures described in the following sections:

Configure the Interface Name on page 286

Configure the Interface Encapsulation on page 286

Enable VLAN Tagging on page 287

Configure the Interface Name

Specify both the physical and logical portions of the interface name, in the following format:

physical.logical

For example, in ge-1/2/1.2, ge-1/2/1 is the physical portion of the interface name and 2 is the logical portion. If you do not specify the logical portion of the interface name, 0 is set by default.

A logical interface can be associated with only one routing instance.



Note

If you enable a routing protocol on all instances by specifying interfaces all when configuring the master instance of the protocol at the [edit protocols] hierarchy level, and you configure a specific interface for VPLS routing at the [edit routing-instances *routing-instance-name*] hierarchy level, the latter interface statement takes precedence and the interface is used exclusively for VPLS.

If you explicitly configure the same interface name at both the [edit protocols] and [edit routing-instances *routing-instance-name*] hierarchy levels, when you try to commit the configuration, it will fail.

Configure the Interface Encapsulation

You need to specify an encapsulation type for each PE-router-to-CE-router interface configured for VPLS. This section describes the encapsulation statement configuration options available for VPLS. For a full description of all of the options available for this statement, see the *JUNOS Internet Software Configuration Guide: Network Interfaces and Class of Service*.

Configure the encapsulation type by including the encapsulation statement at the [edit interfaces] hierarchy level:

```
[edit]
interfaces {
  interface-name {
    encapsulation (ethernet-vpls | extended-vlan-vpls | vlan-vpls);
  }
}
```

You can configure the following interface encapsulations for VPLS routing instances:

ethernet-vpls—Use Ethernet VPLS encapsulation on Ethernet interfaces that have VPLS enabled and that must accept packets carrying standard Tag Protocol ID (TPID) values. On M-series routers, the four-port Fast Ethernet TX PIC and the one-port, two-port, and four-port, four-slot Gigabit Ethernet PICs can use the Ethernet VPLS encapsulation type.

extended-vlan-vpls—Use extended VLAN VPLS encapsulation on Ethernet interfaces that have VLAN 802.1Q tagging and VPLS enabled and that must accept packets carrying TPIDs 0x8100, 0x9100, and 0x9901. On M-series routers, the four-port Fast Ethernet TX PIC and the one-port, two-port, and four-port, four-slot Gigabit Ethernet PICs can use the Ethernet VPLS encapsulation type.

vlan-vpls—Use Ethernet VPLS encapsulation on Ethernet interfaces that have VPLS enabled and that must accept packets carrying standard TPID values. On M-series routers, the four-port Fast Ethernet TX PIC and the one-port, two-port, and four-port, four-slot Gigabit Ethernet PICs can use the Ethernet VPLS encapsulation type.

When you configure the encapsulation as `vlan-vpls`, you also need to configure the same interface encapsulation for the logical interface. Configure the encapsulation statement at the [edit interfaces *interface-name* unit *unit-number*] hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]
encapsulation vlan-vpls;
```

You need to configure the `vlan-vpls` encapsulation on the logical interface because the `vlan-vpls` encapsulation allows you to configure a mixed mode, where some of the logical interfaces use regular Ethernet encapsulation (the default for logical interfaces) and some use `vlan-vpls`. For more information, see the *JUNOS Internet Software Configuration Guide: Network Interfaces and Class of Service*.

Enable VLAN Tagging

The JUNOS software supports receiving and forwarding routed Ethernet frames with 802.1Q virtual local area network (VLAN) tags and running Virtual Router Redundancy Protocol (VRRP) over 802.1Q-tagged interfaces. For VPLS to function properly, configure the router to receive and forward frames with 802.1Q VLAN tags by including the `vlan-tagging` statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
vlan-tagging;
```

Gigabit Ethernet interfaces can be partitioned; you can assign up to 4095 different logical interfaces, one for each VLAN, but you are limited to a maximum of 1024 VLANs on any single Gigabit Ethernet or 10-Gigabit Ethernet port. Fast Ethernet interfaces can also be partitioned, with a maximum of 1024 logical interfaces for the four-port FE PIC and 16 logical interfaces for the M40e. Table 3 lists VLAN ID range by interface type.

Table 3: VLAN ID Range by Interface Type

Interface Type	VLAN ID Range
Fast Ethernet	512 through 1023
Gigabit Ethernet	512 through 4094

To bind a VLAN ID to a logical interface, include the `vlan-id` statement at the `[edit interfaces interface-name unit logical-unit-number]` hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]
vlan-id number;
```

For more information on how to configure VLANs, see the *JUNOS Internet Software Configuration Guide: Network Interfaces and Class of Service*.

Configure the VPLS Site

All the Layer 2 circuits provisioned for a VPLS site are listed as the set of logical interfaces (using the `interface` statement) within the `site` statement.

On each PE router, you must configure each VPLS site that has a connection to the PE router. To do this, include the `site` statement at the `[edit routing-instances routing-instance-name protocols vpls]` hierarchy level:

```
[edit routing-instances routing-instance-name protocols vpls]
site site-name {
  site-identifier identifier;
}
```

You must configure the following for each VPLS site:

`site`—Name of the VPLS site.

`site-identifier`—Unsigned 16-bit number greater than zero that uniquely identifies the VPLS site.

Configure the Site Range

For each VPLS routing instance, you need to configure a site range. The site range specifies the total number of sites in the VPLS. Include the `site-range` statement at the `[edit routing-instances routing-instance-name protocols vpls]` hierarchy level:

```
[edit routing-instances routing-instance-name protocols vpls]
site-range number;
```

Configure an Ethernet Switch as the CE Device

For VPLS configurations, the CE device does not necessarily need to be a router. You can link the PE routers directly to Ethernet switches. However, there are a few configuration issues you should be aware of:

When you configure VPLS routing instances and establish two or more connections between a CE Ethernet switch and a PE router, you must enable the Spanning Tree Protocol (STP) on the switch to prevent loops.

The JUNOS software allows standard Bridge Protocol Data Unit (BPDU) frames to pass through emulated Layer 2 connections, such as those configured with Layer 2 VPNs, Layer 2 circuits, and VPLS instances. However, CE Ethernet switches that generate proprietary BPDU frames might not be able to run STP across Juniper Networks routers configured for these emulated Layer 2 connections.

Map VPLS Traffic to a Specific LSP

It is possible to map VPLS traffic to specific LSPs by configuring forwarding table policies. This procedure is optional but can be useful. The following example illustrates how you can map lower priority VPLS routing instances to slower LSPs while mapping other higher priority VPLS routing instances to faster LSPs. In this example configuration, a-to-b1 and a-to-c1 are high-priority LSPs between the PE routers, while a-to-b2 and a-to-c2 are low-priority LSPs between the PE routers.

Configure the policy-statement vpls-priority statement at the [edit policy-options] hierarchy level:

```
[edit]
policy-options {
  policy-statement vpls-priority {
    term a {
      from {
        rib mpls.0;
        community company-1;
      }
      then {
        install-nexthop lsp [ a-to-b1 a-to-c1 ];
        accept;
      }
    }
    term b {
      from {
        rib mpls.0;
        community company-2;
      }
      then {
        install-nexthop lsp-regex [ "^a-to-b2$" "^a-to-c2$" ];
        accept;
      }
    }
  }
  community company-1 members target:11111:1;
  community company-2 members target:11111:2;
}
```

Include the vpls-priority policy in the forwarding-table statement configuration at the [edit routing-options] hierarchy level:

```
[edit routing-options]
forwarding-table {
  export vpls-priority;
}
```

For more information on how to configure routing policies, see the *JUNOS Internet Software Configuration Guide: Policy Framework*.

Trace VPLS Traffic and Operations

To trace VPLS traffic, you can specify options using the `traceoptions` statement at the `[edit routing-instances routing-instance-name protocols vpls]` hierarchy level:

```
[edit routing-instances routing-instance-name protocols vpls]
traceoptions {
  file filename <replace> <size size> <files number> <nostamp>;
  flag flag <flag-modifier> <disable>;
}
```

The following trace flags display the operations associated with VPLS:

`all`—All VPLS tracing options.

`connections`—VPLS connections (events and state changes).

`error`—Error conditions.

`nlri`—VPLS advertisements received or sent using BGP.

`route`—Trace routing information.

`topology`—VPLS topology changes caused by reconfiguration or advertisements received from other PE routers using BGP.