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**Enterprise Computing Solutions - Education Services**

# TRAINING OFFERING

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# Junos Layer 2 VPNs (JL2V)

| CODE: | LENGTH: | PRICE: |
|---|---|---|
| JUN_JL2V | 24 Hours (3 days) | £2,550.00 |

## Description

This three-day course is designed to provide students with the knowledge to configure and troubleshoot MPLS-based Layer 2 virtual private networks (VPN).
The course includes an overview of MPLS Layer 2 VPN concepts, such as BGP Layer 2 VPNs, LDP Layer 2 circuits, forwarding equivalence class (FEC) 129, virtual private LAN service (VPLS), Ethernet VPN (EVPN), and Inter-AS MPLS VPNs.
This course also covers Junos OS-specific implementations of Layer 2 VPN instances, VPLS, and EVPNs.
This course is based on the Junos OS Release 21.4R1.12. The Junos Layer 2 VPNs (JL2V) course is an advanced-level course.
Relevant Juniper Product · EX Series · MX Series · QFX Series

## Objectives

· Describe some of the different kinds of VPNs, their mechanics, and their use cases.
· Describe the types of MPLS VPN that operate at layer 2.
· Describe the mechanics of BGP-signaled pseudowires, also known as L2VPNs.
· Configure BGP-signaled L2VPNs with Ethernet and Ethernet-VLAN encapsulations.
· Demonstrate how to troubleshoot some of the most common BGP-signaled L2VPN configuration problems.
· Describe how BGP-signaled L2VPNs use a block of labels to bring efficiency to huband-spoke advertisements.
· Configure advanced BGP-signaled L2VPN features, such as multihoming, VLAN normalization, and route target constraint.
· Describe the mechanics of LDP-signaled pseudowires, also known as Layer 2 Circuits.
· Describe the causes and solutions of some of the most common L2Circuit configuration problems.
· Configure advanced LDP-signaled L2Circuit features, such as multihoming and local switching.
· Explain how the FEC 129 pseudowire method combines BGP for autodiscovery and LDP for signaling.
· Describe the purpose and mechanics of a VPLS.
· Create a VPLS instance that is signaled using BGP and demonstrate the commands that verify its status.
· Create VPLS instances that are signaled using LDP and FEC 129 and demonstrate the commands available to verify their status.
· Describe how mismatched VLAN tags are handled in a default VPLS configuration.
· Configure a VPLS to swap mismatched VLAN tags automatically, and to create multiple bridge domains inside a single VPLS instance.
· Configure the most important VPLS traffic management features, including flood protection, MAC limiting, IRB interfaces, and automated Site IDs.
· Configure hub-and-spoke VPLS topologies. · Configure multihomed sites in a VPLS.
· Describe the features of Ethernet VPN, and the enhancements that EVPN brings over VPLS.
· Explain how EVPNs advertise MAC addresses, and how they request to receive flooded traffic within a bridge domain.
· Configure and verify a single-homed VLAN-based EVPN instance.
· Configure and verify a single-homed VLAN-aware bundle EVI.
· Configure a multihomed EVPN and explain the purpose of the EVPN Type 4 route.
· Describe the features provided by EVPN Type 1 routes. · Describe how to use MAC Mobility and IRB interfaces in an EVPN.
· Explain how EVPNs can tightly integrate themselves into MPLS Layer 3 VPNs to provide highly efficient forwarding.
· Describe and configure various solutions that create MPLS VPNs between service providers.
· Describe the circuit-cross connect pseudowire method and explain how this old method can still have value in modern networks.
· Describe how multisegment pseudowires can create layer 2 VPNs across autonomous system boundaries.

## Audience

Individuals responsible for configuring and monitoring devices running the Junos OS in a service provider environment, in MPLS-based data centers, and in larger enterprises

## Prerequisites

· Intermediate-level networking knowledge; · An understanding of OSPF, IS-IS, BGP, and Junos routing policy;
· Experience configuring MPLS label-switched paths using Junos; · Completion of the following courses, or equivalent knowledge:
o Introduction to the Junos Operating System o Junos Service Provider Switching o Junos Intermediate Routing
o Junos MPLS Fundamentals

## Programme

Day 1  Course Introduction  Refresher—VPNs and MPLS      · Explain the basic function and purpose of a VPN
· Describe how MPLS uses labels to forward traffic · Explain the differences between MPLS layer 3 VPNs and MPLS layer 2 VPNs
The Different Flavors of Layer 2 VPN · Describe the purpose and creation of pseudowires
· Define the different technical terms relating to pseudowires · Describe the purpose and creation of VPLS
· Describe the purpose, creation, and advantages of EVPN  L2VPN, aka BGP-Signaled Pseudowires
· Define the concept of an attachment circuit, and of pseudowire encapsulation
· Explain the importance of route targets, route distinguishers, and Site IDs · Explain the control plane and data plane of an L2VPN
· Describe the contents of an L2VPN BGP packet capture  L2VPN—Configuration
· Configure an L2VPN that accepts all Ethernet traffic · Configure an L2VPN that accepts specific VLAN tags
L2VPN—Troubleshooting
· Diagnose and fix L2VPN problems caused by missing LSPs, mismatched site information, and incorrect configuration
L2VPN—Site IDs, the Label Base, and Overprovisioning · Explain the purpose of the Site ID and the VPN label base
· Configure an overprovisioned L2VPN with explicit remote Site IDs
· Configure an overprovisioned L2VPN with implicit remote Site IDs · Lab 1: BGP-Signaled Layer 2 VPNs
L2VPN—Advanced Concepts · Configure and verify L2VPN multihoming · Explain the purpose of Martini encapsulation
· Configure VLAN normalization in an L2VPN · Configure out-of-band route reflection and route target constraint
Lab 2: L2VPNs—Advanced Concepts  L2Circuit—LDP-Signaled Pseudowires
· Explain the concept of targeted LDP sessions, and the elements that L2Circuits have in common with L2VPNs
· Configure and verify an L2Circuit · Describe the contents of an LDP advertisement packet capture  L2Circuit—Troubleshooting
· Configure the Pseudowire Status TLV · Explain the meaning of the most frequent L2Circuit error codes  Day 2
L2Circuit—Advanced Concepts · Describe the purpose and benefits of virtual circuit connectivity verification
· Configure multihoming, local switching, and interworking  Lab 3: LDP-Signaled L2Circuits  FEC 129 Pseudowires
· Explain the way that FEC 129 autodiscovers remote PEs and signals pseudowires · Configure and verify a FEC 129 pseudowire
Lab 4: FEC 129 Pseudowires (Optional) Virtual Private LAN Service—Introduction
· Describe how a VPLS is built, and how it compares to a regular pseudowire
· Explain how VPLS forwards traffic between multiple sites · Describe the BGP and LDP methods of signaling a VPLS
VPLS—LDP and FEC 129 Configuration and Verification · Configure and verify an LDP-signaled VPLS
· Configure and verify a FEC 129 VPLS  VPLS—LDP and FEC 129 Configuration and Verification
· Configure and verify an LDP-signaled VPLS · Configure and verify a FEC 129 VPLS  VPLS—The Default VLAN Mode
· Define the four VLAN modes for VPLS · Define the concept of a bridge domain, and verify the default VPLS VLAN mode
VPLS—VLAN Normalization, VLAN-Aware Instances, and Dual-Stacked VLANs · Configure and verify VLAN-Aware mode
· Configure and verify VLAN-Normalizing mode and No-VLAN mode · Configure and verify dual-stacked VLAN tags in VPLS
VPLS—Advanced Features and Troubleshooting · Deploy automated BGP VPLS Site IDs
· Configure flood protection, MAC flap protection, and MAC limiting
· Explain how to add IRB interfaces to a VPLS, and configure efficient traffic flooding using multicast LSPs · Describe the most
important VPLS-specific troubleshooting techniques
 VPLS—Multihoming · Configure multihomed sites in a BGP-signaled VPLS
· Configure multihomed sites and single sites on the same PE in a BGP-signaled VPLS
· Configure best-site multihoming in a BGP-signaled VPLS · Configure multihomed sites in an LDP-signaled VPLS  Lab 5: VPLS
Day 3  EVPN—Introduction · Explain the main disadvantages of a VPLS solution
· Explain how EVPN overcomes these disadvantages, and enables extra features
EVPN—Using BGP to Advertise MACs and to Flood Traffic · Explain the meaning of an EVPN Instance
· Describe how EVPN Type 2 routes advertise MAC addresses and MAC/IP bindings
· Describe how EVPN Type 3 routes request to receive flooded traffic within a bridge domain
EVPN—Configuring a Single-Homed VLAN- Based EVI · Configure a service provider network to host EVPN services
· Configure a single-homed VLAN-based EVI · Verify a VLAN-based EVI
EVPN—Configuring a Single-Homed VLAN- Aware Bundle EVI · Configure a VLAN-aware bundle EVI
· Verify a VLAN-aware bundle EVI  EVPN—Multihoming Configuration and Type 4 Routes
· Configure a CE and two PEs to take part in a multihomed EVPN · Describe the contents of the Type 4 Ethernet Segment route
· Explain how the Type 4 route prevents layer 2 loops, using the designated forwarder election
EVPN—Multihoming Features Using Type 1 Routes · Describe Type 1 Ethernet Auto-Discovery PerEthernet Segment routes
· Explain how Type 1 Per-Ethernet Segment routes prevent layer 2 loops
· Describe how Type 1 Per-EVI routes are different from Per-ES routes  EVPN—MAC Mobility and IRB Interfaces
· Configure and verify the EVPN MAC Mobility feature · Configure and verify Automatic Gateway MAC-IP Synchronization
· Configure and verify Manual Gateway MAC-IP Synchronization · Configure and verify EVPN Virtual Gateway Addresses
Lab 6: EVPN  VPLS—LDP and FEC 129 Configuration and Verification · Configure and verify an LDP-signaled VPLS
· Configure and verify a FEC 129 VPLS  VPLS—The Default VLAN Mode · Define the four VLAN modes for VPLS
· Define the concept of a bridge domain, and verify the default VPLS VLAN mode
VPLS—VLAN Normalization, VLAN-Aware Instances, and Dual-Stacked VLANs · Configure and verify VLAN-Aware mode
· Configure and verify VLAN-Normalizing mode and No-VLAN mode · Configure and verify dual-stacked VLAN tags in VPLS
VPLS—Advanced Features and Troubleshooting · Deploy automated BGP VPLS Site IDs

· Configure flood protection, MAC flap protection, and MAC limiting
· Explain how to add IRB interfaces to a VPLS, and configure efficient traffic flooding using multicast LSPs · Describe the most important VPLS-specific troubleshooting techniques

      VPLS—Multihoming · Configure multihomed sites in a BGP-signaled VPLS
· Configure multihomed sites and single sites on the same PE in a BGP-signaled VPLS
· Configure best-site multihoming in a BGP-signaled VPLS · Configure multihomed sites in an LDP-signaled VPLS
Self-Study Material  Appendix A: EVPN—Integration with L3VPNs · Describe the basic functionality of an L3VPN
· Explain how EVPNs and L3VPNs integrate for optimal routing
· Describe how chained composite next hop brings efficiency to EVPN in the Packet Forwarding Engine
Appendix B: Inter-AS MPLS VPNs · Describe the functionality of Interprovider Options A, B, and C
· Configure and verify the Interprovider Option C method · Describe and configure carrier-of-carriers VPNs
Appendix C: Circuit Cross-Connect
· Use circuit cross-connect to stitch pseudowires together, and to signal pseudowires that have their own pair of dedicated RSVP LSPs
 Appendix D: Multisegment Pseudowires · Explain how a multisegment pseudowire is signaled
· Configure and verify a multisegment pseudowire  Lab 7: Inter-AS L2VPNs  Appendix E: VPLS—Hub-and-Spoke Topologies
· Configure a hub-and-spoke BGP VPLS using route targets · Configure a hub-and-spoke BGP VPLS using site ranges
· Configure a hub-and-spoke LDP VPLS using hierarchical VPLS

## Follow on courses

Junos Layer 3 VPNs

## Test and Certification

Associated Certification JNCIP-SP

## Session Dates

| Date | Location | Time Zone | Language | Type | Guaranteed | PRICE |
|------|----------|-----------|----------|------|------------|-------|
| 02 Sep 2024 | Virtual Training Class - TP | BST | English | Instructor Led Online | | £2,550.00 |
| 25 Nov 2024 | Virtual Training Class - TP | GMT | English | Instructor Led Online | | £2,550.00 |

## Additional Information

This training is also available as onsite training. Please contact us to find out more.