Junos Layer 2 VPNs

Durée: 2 Jours **Réf de cours: JL2V** **Version: 21.x** **Méthodes d'apprentissage: Virtual Learning**

Résumé:

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.
[Formation délivrée en anglais par Juniper]
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Public visé:

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

Objectifs pédagogiques:

- · 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.
- · 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.

- · 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.
- · Describe how multisegment pseudowires can create layer 2 VPNs across autonomous system boundaries.

Pré-requis:

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· 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
- IJOS - Introduction au système d'exploitation Junos - Juniper
- JSPX - Commutation pour réseaux Service Provider - Juniper
- JIR - Routage intermédiaire Junos - Juniper
- JMF - Junos MPLS Fundamentals

Après cette formation, nous vous conseillons le(s) module(s) suivant(s):

- AJSPR - Advanced Junos Service Provider Routing
- JL3V - Junos Layer 3 VPNs
- JCOS - Junos Class of Service
- JMR - Junos Multicast Routing

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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

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
- · Configure and verify an LDP-signaled VPLS
- · Configure and verify a FEC 129 VPLS
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- · 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
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VPLS—VLAN Normalization, VLAN-Aware Instances, and Dual-Stacked VLANs

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
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- · Configure and verify a FEC 129 VPLS
- · Configure and verify an LDP-signaled VPLS
- · Configure and verify a FEC 129 VPLS

VPLS—The Default VLAN Mode

- · 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

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- · 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
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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
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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
- · 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

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EVPN—Introduction

- · Explain the main disadvantages of a VPLS solution
- · Explain how EVPN overcomes these disadvantages, and enables extra features
- · Define the four VLAN modes for VPLS
- · Define the concept of a bridge domain, and verify the default VPLS VLAN mode
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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
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- · Configure multihomed sites in an LDP-signaled VPLS

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

Méthodes pédagogiques :

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

Autres moyens pédagogiques et de suivi:

• Compétence du formateur : Les experts qui animent la formation sont des spécialistes des matières abordées et ont au minimum cinq ans d'expérience d'animation. Nos équipes ont validé à la fois leurs connaissances techniques (certifications le cas échéant) ainsi que leur compétence pédagogique.
• Suivi d'exécution : Une feuille d'émargement par demi-journée de présence est signée par tous les participants et le formateur.
• Modalités d'évaluation : le participant est invité à s'auto-évaluer par rapport aux objectifs énoncés.
• Chaque participant, à l'issue de la formation, répond à un questionnaire de satisfaction qui est ensuite étudié par nos équipes pédagogiques en vue de maintenir et d'améliorer la qualité de nos prestations.

Délais d'inscription :

•Vous pouvez vous inscrire sur l'une de nos sessions planifiées en inter-entreprises jusqu'à 5 jours ouvrés avant le début de la formation sous réserve de disponibilité de places et de labs le cas échéant.
•Votre place sera confirmée à la réception d'un devis ou ""booking form"" signé. Vous recevrez ensuite la convocation et les modalités d'accès en présentiel ou distanciel.
•Attention, si vous utilisez votre Compte Personnel de Formation pour financer votre inscription, vous devrez respecter un délai minimum et non négociable fixé à 11 jours ouvrés.