Junos Layer 2 VPNs

COURSE OVERVIEW

This two-day course is designed to provide students with the knowledge required to design, implement, and troubleshoot a wide variety of layer 2 MPLS VPNs, including pseudowires (BGP L2VPNs, LDP L2Circuits, FEC 129, and CCC), virtual private LAN service (VPLS), Ethernet VPN (EVPN), and Inter-AS Layer 2 VPNs.

This course is based on Junos 21.2R1 and contains hands-on labs that gives extensive CLI configuration practice as well as many examples of common errors, and the troubleshooting steps required to fix them.

COURSE LEVEL

intermediate-to-advanced

INTENDED AUDIENCE

The primary audiences for this course are the following:

- Individuals responsible for designing, implementing, and troubleshooting MPLS VPNs which operate at layer 2
- Individuals who work with, or who aspire to work with, service provider networks
- Individuals studying for the JNCIP-SP or JNCIE-SP exam

PREREQUISITES

The following are the prerequisite skills for this course:

- Strong general TCP/IP knowledge
- Junos knowledge to JNCIA-Junos level
- LDP/RSVP and routing/switching knowledge to JNCIS-SP level

The following are the prerequisite courses that should be completed before attending this course (or equivalent knowledge):

- *Getting Started with Networking* (eLearning)
- *Introduction to the Junos Operating System* (IJOS)
- *Junos MPLS Fundamentals* (JMF)
- *Junos Intermediate Routing* (JIR)
- *Junos Enterprise Switching* (JEX), *Junos Service Provider Switching* (JSPX), or both

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OBJECTIVES

After successfully completing this course, you should be able to:

- Describe some of the different kinds of VPN, their mechanics and their use cases
- Discuss the types of MPLS VPN which operate at layer 2
- Discuss the mechanics of BGP-signaled pseudowires, also known as a Layer 2 VPN (L2VPN)
- Configure and troubleshoot BGP-signaled L2VPNs
- Describe how and why L2VPNs advertise a range of labels
- Configure advanced BGP-signaled L2VPN features
- Discuss the mechanics of LDP-signaled pseudowires, also known as a Layer 2 Circuit (L2Circuit)
- Identify and fix common L2Circuit problems
- Configure advanced LDP-signaled L2Circuit features
- Discuss the mechanics of FEC 129 pseudowires, which combines BGP for autodiscovery and LDP for signaling
- Describe the purpose and mechanics of a VPLS
- Configure and verify VPLS
- Configure and verify different VPLS VLAN modes
- Describe and configure VPLS advanced features, and VPLS troubleshooting
- Configure advanced VPLS topologies
- Describe the features and advantages of Ethernet VPN
- Configure and verify single-homed EVPN instances
- Explain, configure, and verify EVPN multihoming
- Configure EVPN IRB interfaces, and other advanced EVPN concepts

COURSE CONTENTS

DAY 1

1 Course Introduction

2 Refresher: VPNs and MPLS

- IPsec VPNs and MPLS VPNs
- Layer 3 VPNs and layer 2 VPNs

3 The Different Flavors of Layer 2 VPN

- Discuss the function and creation of pseudowires
- Discuss the function and creation of VPLS
- Discuss the function and creation of EVPN

4 L2VPN aka BGP-Signaled Pseudowires

- Define some essential L2VPN terminology
- Explore the control plane and data plane of an L2VPN
- Observe an L2VPN packet capture

5 L2VPN Configuration and Troubleshooting

- Configure an L2VPN which accepts all Ethernet traffic
- Configure an L2VPN which accepts specific VLAN tags
- Troubleshoot common L2VPN problems

6 L2VPN—Site IDs, The Label Base, and Overprovisioning

- The Site ID and the VPN label
- Overprovisioned L2VPN configuration

Lab 1: BGP-Signaled L2VPNs

7 L2VPN Advanced Concepts

- Configure and verify multihoming
- Explain Martini encapsulation and VLAN normalization
- Configure traffic policing, out-of-band route reflection, and route target constraint

Lab 2: L2VPNs—Advanced Concepts

8 L2Circuit, aka L2DP-Signalled Pseudowires

- Configure and verify an L2Circuit
- Analyze a packet capture of an LDP advertisement

9 L2Circuit—Troubleshooting

- Configure the Pseudowire Status TLV
- Observe the most frequent L2Circuit error statuses

9 L2Circuit—Troubleshooting

- Configure the Pseudowire Status TLV
- Observe the most frequent L2Circuit error statuses

10 L2Circuit—Advanced Concepts

- Enable Virtual Circuit Connectivity Verification
- Configure multihoming, local switching, and interworking

Lab 3: LDP-Signaled L2Circuits

DAY 2

11 FEC 129 Pseudowires

- Discuss the mechanics of FEC 129
- Configure and verify a FEC 129 pseudowire

Lab 4: FEC 129 Pseudowires (Optional)

12 Virtual Private LAN Service—Introduction

- Explain how VPLS forwards traffic between multiple sites
- Describe the three methods of signaling VPLS

13 VPLS—Configuration and Verification

- Configure a BGP-signaled VPLS
- Verify a BGP-signaled VPLS
- Configure and verify an LDP-signaled VPLS
- Configure and verify a FEC 129 VPLS

14 VPLS—The Four Modes of MAC Learning

- Configure and verify the default VLAN mode and VLAN-Aware mode
- Configure and verify VLAN-Normalizing mode and No-VLAN mode
- Configure and verify dual-stacked VLAN tags in VPLS

15 VPLS—Advanced Features and Troubleshooting

- Configure protection and MAC limiting in a VPLS
- Add IRB interfaces to VPLS instances, and configure efficient traffic flooding
- Describe VPLS-specific troubleshooting techniques

16 VPLS—Advanced Topologies

- Configure hub-and-spoke VPLS
- Configure multihomed sites in a VPLS

Lab 5: VPLS

COURSE CONTENTS (contd.)

DAY 2 (contd.)

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EVPN—Introduction

- Describe how to query Junos OS Evolved system state
- Troubleshoot object dependency issues

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EVPN—Single-Homed Configuration

- Describe the advantages of EVPN over VPLS
- Explain the structure and purpose of EVPN route types 2 and 3

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EVPN—Multihoming

- Explain the system logging and tracing infrastructure in Junos OS Evolved
- Explain how to retrieve support information and statistics
- Explain how to inspect Docker container statistics and configuration details

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EVPN—Advanced Concepts and Troubleshooting

- Describe the advantages of EVPN over VPLS
- Explain the structure and purpose of EVPN route types 2 and 3

Lab 6: EVPN

A

Appendix: Inter-AS L2VPNs (Optional)

- Explain the system logging and tracing infrastructure in Junos OS Evolved
- Explain how to retrieve support information and statistics
- Explain how to inspect Docker container statistics and configuration details

B

Appendix: Circuit Cross-Connect (Optional)

- Configure and verify Automatic Gateway MAC-IP Synchronization
- Describe host routes in an L3VPN
- Configure alternative IRB methods
- Configure advanced EVPN features and mechanics