Junos MPLS and VPNs

Duration: 5 Days Course Code: JMV

Overview:

This five-day course is designed to provide students with MPLS-based virtual private network (VPN) knowledge and configuration examples. The course includes an overview of MPLS concepts such as control and forwarding plane, RSVP Traffic Engineering, LDP, Layer 3 VPNs, BGP Layer 2 VPNs, LDP Layer 2 Circuits, and virtual private LAN service (VPLS), carrier-of-carrier VPNs. This course also covers Junos operating system-specific implementations of Layer 2 control instances and active interface for VPLS. This course is based on the Junos OS Release 12.3R2.5.

Through demonstrations and hands-on labs, students will gain experience in configuring and monitoring the Junos OS and in device operations. JMV is an advanced-level course.

Target Audience:

This course benefits individuals responsible for configuring and monitoring devices running the Junos OS

Objectives:

- After successfully completing this course, you should be able to:
- Explain common terms relating to MPLS.
- Explain routers and the way they forward MPLS packets.
- Explain packet flow and handling through a label-switched path (LSP)
- Describe the configuration and verification of MPLS forwarding.
- Understand the information in the Label Information Base.
- Explain the two label distribution protocols used by the Junos OS.
- Configure and troubleshoot RSVP-signaled and LDP-signaled LSPs.
- Explain the constraints of both RSVP and LDP.
- Explain the path selection process of RSVP without the use of the Constrained Shortest Path First (CSPF) algorithm.
- Explain the Interior Gateway Protocol (IGP) extensions used to build the Traffic Engineering Database (TED).
- Describe the CSPF algorithm and its path selection process.
- Describe administrative groups and how they can be used to influence path selection.
- Describe the default traffic protection behavior of RSVP-Signaled LSPs.
- Explain the use of primary and secondary LSPs.
- Explain LSP priority and preemption.
- Describe the operation and configuration of fast reroute.
- Use operational commands to view Layer 3 VPN control exchanges.
- Use operational commands to display Layer 3 VPN VRF tables.
- Monitor and troubleshoot PE-CE routing protocols.
- Describe the four ways to improve Layer 3 VPN scaling.
- Describe the three methods for providing Layer 3 VPN customers with Internet access.
- Describe how the auto-export command and routing table groups can be used to support communications between sites attached to a common PE router.
- Describe the flow of control and data traffic in a hub-and-spoke topology.
- Describe the various Layer 3 VPN class-of-service (CoS) mechanisms supported by the Junos OS.
- Explain the Junos OS support for generic routing encapsulation (GRE) and IP Security (IPsec) tunnels in Layer 3 VPNs.
- Describe the flow of control traffic and data traffic in a next-generation MVPN.
- Describe the configuration steps for establishing a next-generation MVPN.
- Monitor and verify the operation of next-generation MVPNs.
- Describe the purpose and features of a BGP Layer 2 VPN.
- Describe the roles of a CE device, PE router, and P router in a BGP Layer 2 VPN.
- Explain the flow of control traffic and data traffic for a BGP Layer 2 VPN.

- Describe the operation and configuration of link and node protection.
- Describe the LSP optimization options.
- Explain the purpose of several miscellaneous MPLS features.
- Explain the definition of the term “Virtual Private Network”.
- Describe the differences between provider-provisioned and customer-provisioned VPNs.
- Describe the differences between Layer 2 VPNs and Layer 3 VPNs.
- Explain the features of provider-provisioned VPNs supported by the Junos OS.
- Explain the roles of Provider (P) routers, Provider Edge (PE) routers, and Customer Edge (CE) routers.
- Describe the VPN-IPv4 address formats.
- Describe the route distinguisher use and formats.
- Explain the RFC 4364 control flow.
- Create a routing instance, assign interfaces, create routes, and import and export routes within the routing instance using route distinguishers and route targets.
- Explain the purpose of BGP extended communities and how to configure and use these communities.
- Describe the steps necessary for proper operation of a PE to CE dynamic routing protocol.
- Configure a simple Layer 3 VPN using a dynamic CE-PE routing protocol.
- Describe the routing-instance switch.
- Explain the issues with the support of traffic originating on multiaccess VPN routing and forwarding table (VRF table) interfaces.
- Configure a BGP Layer 2 VPN and describe the benefits and requirements of over-provisioning.
- Monitor and troubleshoot a BGP Layer 2 VPN.
- Explain the BGP Layer 2 VPN scaling mechanisms and route reflection.
- Describe the Junos OS BGP Layer 2 VPN CoS support.
- Describe the flow of control and data traffic for an LDP Layer 2 circuit.
- Configure an LDP Layer 2 circuit.
- Monitor and troubleshoot an LDP Layer 2 circuit.
- Describe and configure circuit cross-connect (CCC) MPLS interface tunneling.
- Describe the difference between Layer 2 MPLS VPNs and VPLS.
- Explain the purpose of the PE device, the CE device, and the P device.
- Explain the provisioning of CE and PE routers.
- Describe the signaling process of VPLS.
- Describe the learning and forwarding process of VPLS.
- Describe the potential loops in a VPLS environment.
- Configure BGP and LDP VPLS.
- Troubleshoot VPLS.
- Describe the Junos OS support for carrier of carriers.
- Describe the Junos OS support for interprovider VPNs.

Prerequisites:

Students should have intermediate-level networking knowledge and an understanding of the Open Systems Interconnection (OSI) model and the TCP/IP protocol suite. Students should also have familiarity with the Protocol Independent Multicast-Sparse Mode (PIM-SM) protocol. Students should also attend the "Introduction to the Junos Operating System (IJOS)", "Junos Routing Essentials (JRE)" ,"Junos Service Provider Switching (JSPX)" and "Junos Intermediate Routing (JIR)" courses prior to attending this class.

Content:

MPLS Fundamentals

- MPLS Foundation
- Terminology
- MPLS Configuration
- MPLS Packet Forwarding
- Lab 1: MPLS Fundamentals
- Label Distribution Protocols

Label Distribution Protocols

- RSVP
- LDP
- Lab 2: Label Distribution Protocols

Constrained Shortest Path First

- RSVP Behavior Without CSPF
- CSPF Algorithm
- CSPF Tie Breaking
- Administrative Groups
- Lab 3: CSPF

Traffic Protection and Optimization

- Default Traffic Protection Behavior
- Primary and Secondary LSPs
- Fast Reroute
- Bypass LSPs
- LSP Optimization
- Lab 4: Traffic Protection

Miscellaneous MPLS Features

- Routing Table Integration
- Forwarding Adjacencies
- Policy Control over LSP Selection
- LSP Metrics
- Automatic Bandwidth
- TTL Handling
- Explicit Null Configuration
- MPLS Pings
- Lab 5: Miscellaneous MPLS Features

VPN Review

- Overview of VPNs
- CPE-Based VPNs
- Provider-Provisioned

Layer 3 VPNs

- Layer 3 VPN Terminology
- Operational Characteristics
- Lab 6: VPN Baseline Configuration

Basic Layer 3VPN Configuration

- Preliminary Steps
- PE Router Configuration
- Lab 7: Layer 3 VPN with Static and BGP Routing

Troubleshooting Layer 3 VPNs

- A Layered Approach
- The routing-instance Switch
- PE-Based and CE-Based Traceroutes
- Viewing VRF Tables and PE-PE Signaling Flow

Monitoring PE-CE Routing Protocols

Layer 3 VPN Scaling and Internet Access

- Scaling Layer 3 VPNs
- Public Internet Access Options
- Lab 8: Route Reflection and Internet Access

Layer 3 VPNs—Advanced Topics

- Exchanging Routes Between VRF Tables
- Hub-and-Spoke Topologies
- Layer 3 VPN CoS Options
- Layer 3 VPN and GRE Tunneling Integration
- Layer 3 VPN and IPsec Integration
- Lab 9: GRE Tunnel Integration

Multicast VPNs

- Multicast VPN Overview
- Next-Generation MVPN Operation
- Configuration
- Monitoring

BGP Layer 2 VPNs

- Overview of Layer 2 Provider-Provisioned VPNs
- BGP Layer 2 VPN Operational Model: Control Plane
- BGP Layer 2 VPN Operational Model: Data Plane
- Preliminary BGP Layer 2 VPN Configuration
- BGP Layer 2 Configuration
- Monitoring and Troubleshooting BGP Layer 2 VPNs
- Lab 10: BGP Layer 2 VPNs

Layer 2 VPN Scaling and CoS

- Review of VPN Scaling Mechanisms
- Layer 2 VPNs and CoS

LDP Layer 2 Circuits

- LDP Layer 2 Circuit Operation
- LDP Layer 2 Circuit Configuration
- LDP Layer 2 Circuit Monitoring and Troubleshooting
- Circuit Cross-Connect
- Lab 11: Circuit Cross-Connect and LDP Layer 2 Circuits

Virtual Private LAN Services

- Layer 2 MPLS VPNs Versus VPLS
- BGP VPLS Control Plane
- BGP VPLS Data Plane
- Learning and Forwarding Process
- Loops

VPLS Configuration

- VPLS Configuration
- VPLS Troubleshooting
- Lab 12: VPLS

Interprovider VPNs

- Hierarchical VPN Models
- Junos Support of Carrier-of-Carriers Model
- Junos Support of Carrier-of-Carrier VPN Applications
- Lab 13: Carrier-of-Carrier VPNs

Additional Information:

JMV is an advanced-level course

Further Information:

For More information, or to book your course, please call us on Head Office 01189 123456 / Northern Office 0113 242 5931

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