

# Advanced Junos Enterprise Routing (AJER)

Engineering Simplicity

## COURSE OVERVIEW

This five-day course is designed to provide students with the tools required for implementing, monitoring, and troubleshooting Layer 3 components in an enterprise network. Detailed coverage of OSPF, BGP, multicast, class of service (CoS), and EVPN-VXLAN is covered in depth. The course also exposes students to common troubleshooting commands and tools used to troubleshoot various intermediate to advanced issues.

Through demonstrations and hands-on labs, students will gain experience in configuring and monitoring the Junos operating system and in monitoring device and protocol operations.

This course uses Juniper Networks vSRX virtual firewall for the hands-on component, but the lab environment does not preclude the course from being applicable to other Juniper hardware platforms running Junos OS. This course is based on Junos OS Release 19.3R1.8.

### COURSE LEVEL

Advanced

### AUDIENCE

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

### PREREQUISITES

- Basic networking knowledge
- An understanding of the Open Systems Interconnection (OSI) model and the TCP/IP protocol suite
- Working experience with basic routing principles.
- Attend the *Introduction to the Junos Operating System (IJOS)* and *Junos Intermediate Routing (JIR)* courses prior to attending this class

### RELEVANT JUNIPER PRODUCT

- Junos OS
- M Series
- MX Series
- SRX Series

### ASSOCIATED CERTIFICATION

[JNCIP-ENT](#)

### RECOMMENDED NEXT COURSE

JNCIE-ENT Bootcamp

### CONTACT INFORMATION

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### OBJECTIVES

- Describe the various OSPF link-state advertisement (LSA) types.
- Explain the flooding of LSAs in an OSPF network.
- Describe the shortest-path-first (SPF) algorithm.
- Describe OSPF link metrics.
- Describe the various OSPF authentication methods.
- Explain the differences between OSPFv2 and OSPFv3.
- Describe OSPF area types and operations.
- Configure various OSPF area types.
- Summarize and restrict routes.
- Configure OSPF multi-area adjacencies.
- Configure OSPF virtual links.
- Explain OSPF external reachability.
- List useful commands that are used to troubleshoot and verify OSPF.
- Isolate different OSPF issues.
- Describe BGP operations.
- Configure various BGP options.
- Explain the route selection process for BGP.
- Describe how to alter the route selection process.
- Explain the use of routing policies in BGP.
- Explain how BGP routes are processed.
- Describe the various BGP attributes and their use.
- Manipulate common BGP attributes.
- Review common BGP troubleshooting procedures.
- List common BGP troubleshooting commands.
- Identify issues with BGP peering.
- Explain reasons to use BGP in the Enterprise.
- Explain how ISP policies can influence external connectivity.
- Describe three common routing policies for external connectivity in the enterprise.
- Identify common commands for troubleshooting routing policy.
- Describe basic multicast terminology.
- Describe the multicast address space.
- Describe how RPF is used in a multicast network.
- Describe the basic functionality of IGMP.
- Describe the multicast service models and modes.
- Describe PIM-SM operation and configuration when using the ASM model.
- Describe PIM-SM operation and configuration when using the SSM model.
- Verify and troubleshoot multicast.
- Identify environments that may require a modified CoS implementation.
- Describe the various CoS components and their respective functions.
- Explain the CoS processing along with CoS defaults on SRX Series devices.
- Describe situations in which some CoS features are used in the enterprise.
- Describe the use of the Real-Time Performance Monitoring tool.
- Verify and troubleshoot CoS.

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## OBJECTIVES (contd.)

- Describe a traditional Campus network design.
- Understand the need for a new architectural design.
- Describe the five key concepts of the Evolved Core.
- Describe the benefits of a Layer 3-based Campus Networks.
- Describe Layer 2 tunneling.
- Explain VXLAN functionality.
- Describe VXLAN gateways.
- Describe EVPN features.
- Describe EVPN operations.
- Describe EVPN with VXLAN for data plane encapsulation.
- Configuring a Spine Only EVPN-VXLAN network.
- Add IP Fabric nodes to the Spine Only architecture.
- Configure a new IP Fabric EVPN-VXLAN network.
- Describe EVPN route information.
- List useful EVPN-VXLAN commands.

## COURSE CONTENT

### DAY 1

<b>1</b>	<b>Course Introduction</b>
<b>2</b>	<b>OSPF</b> <ul style="list-style-type: none"> <li>• OSPFv2 Review</li> <li>• Link-State Advertisements</li> <li>• Protocol Operations</li> <li>• OSPF Authentication</li> <li>• OSPFv3</li> </ul> <b>LAB 1: Configuring and Monitoring OSPF</b>
<b>3</b>	<b>OSPF Areas</b> <ul style="list-style-type: none"> <li>• Review of OSPF Areas</li> <li>• Stub Area Operation</li> <li>• Stub Area Configuration</li> <li>• NSSA Operation</li> <li>• NSSA Configuration</li> <li>• Route Summarization</li> </ul> <b>LAB 2: Configuring and Monitoring OSPF Areas and Route Summarization</b>
<b>4</b>	<b>Advanced OSPF Options</b> <ul style="list-style-type: none"> <li>• OSPF Multi-Area Adjacencies</li> <li>• Virtual Links</li> <li>• External Reachability</li> </ul> <b>LAB 3: Configuring and Monitoring Routing Policy and Advanced OSPF Options</b>

### DAY 2

<b>5</b>	<b>Troubleshooting OSPF</b> <ul style="list-style-type: none"> <li>• Troubleshooting OSPF Adjacency Issues</li> <li>• Troubleshooting LSDB Consistency Issues</li> <li>• Case Study – Adjacency Issues</li> </ul> <b>LAB 4: Troubleshooting OSPF</b>
<b>6</b>	<b>BGP</b> <ul style="list-style-type: none"> <li>• Review of BGP</li> <li>• BGP Configuration Options</li> <li>• BGP Operations</li> <li>• BGP Path Selection and Options</li> </ul> <b>LAB 5: Implementing BGP</b>
<b>7</b>	<b>BGP Attributes and Policy</b> <ul style="list-style-type: none"> <li>• Policy and BGP</li> <li>• BGP Attributes</li> <li>• Details and Manipulation of Common BGP Attributes</li> </ul> <b>LAB 6: BGP Attributes</b>
<b>8</b>	<b>Troubleshooting BGP</b> <ul style="list-style-type: none"> <li>• BGP Troubleshooting</li> <li>• BGP Case Study</li> </ul> <b>LAB 7: Troubleshooting BGP</b>

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# Advanced Junos Enterprise Routing (AJER)

## COURSE CONTENT (contd.)

### DAY 3

#### 9 Enterprise Routing Policies

- Enterprise BGP Core Network Design
- Enterprise External Network Deployment

**LAB 8: Implementing Enterprise Routing Policies**

#### 10 Troubleshooting Policies

- Routing Policy Overview
- Routing Policy Structure
- Using RegEx
- Routing Policy Troubleshooting
- Case Study

**LAB 9: Troubleshooting Routing Policies**

#### 11 Introduction to Multicast

- Overview of Multicast
- Multicast Addressing
- RPF
- IGMP

### DAY 4

#### 12 Multicast Routing Protocols and SSM

- Overview of Multicast Routing Protocols
- PIM-SM Using the ASM Model
- PIM-SM Using the SSM Model

**LAB 10: Implementing PIM-SM**  
**LAB 11: Implementing SSM**

#### 13 Troubleshooting Multicast

- Multicast Troubleshooting
- Multicast Case Study

**LAB 12: Troubleshooting Multicast**

#### 14 Class of Service

- CoS Components Review and Case Study
- CoS Processing and CoS Defaults on the SRX Series Device
- Policing
- Virtual Channels
- Monitoring with Resource Performance Monitoring

**LAB 13: Implementing CoS Features in the Enterprise**

#### 15 Troubleshooting Class of Service

- CoS Troubleshooting
- CoS Case Study

**LAB 14: Troubleshooting Class of Service**

### DAY 5

#### 16 Enterprise Architectures

- Traditional Enterprise Networks
- A New Architecture
- Key Concepts of the Evolved Core
- IP Fabric Campus Design

#### 17 VXLAN

- Layer 2 Connectivity over a Layer 3 Network
- VXLAN Overview
- VXLAN Gateways

#### 18 EVPN-VXLAN

- Overview of EVPN
- EVPN Operations
- EVPN and VXLAN

#### 19 Configuring EVPN-VXLAN

- EVPN-VXLAN Spine Only Network
- IP Fabric Leaf Nodes in a Spine Only Design
- A New IP Fabric EVPN-VXLAN Network

#### 20 Verify and Troubleshoot EVPN-VXLAN

- EVPN Routes
- Useful EVPN Commands

#### A BGP Route Reflection

- Route Reflection Operation
- Configuration and Routing Knowledge

**LAB: BGP Route Reflection (Optional)**

#### B Troubleshooting IS-IS

- IS-IS Troubleshooting

**LAB: Troubleshooting IS-IS and Mixed Environments (Optional)**

#### C Additional Troubleshooting

- RIP Troubleshooting
- IGP Troubleshooting Case Studies

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Course content subject to change. See [www.juniper.net/courses](http://www.juniper.net/courses) for the latest details.