

## Advanced Junos Service Provider Routing

### COURSE OVERVIEW

This five-day, advanced-level course is designed to provide students with detailed coverage of OSPF, IS-IS, BGP, and routing policy. Through examples, demonstrations, and hands-on labs, students will gain experience in configuring, monitoring, and troubleshooting the Junos operating system and in monitoring device and protocol operations.

This course uses Juniper Networks vMX Series Routers 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 23.2.

### COURSE LEVEL

[Advanced Junos Service Provider Routing](#) is an advanced-level course.

### AUDIENCE

This course benefits individuals responsible for implementing, monitoring, and troubleshooting Layer 3 components of a service provider's network.

### PREREQUISITES

The prerequisites for this course include:

- Intermediate-level networking knowledge and an understanding of the OSI model and the TCP/IP protocol suite; and
- Completion of the [Introduction to the Junos Operating System](#) and [Junos Intermediate Routing](#) courses prior to attending this class.

### RELATED CERTIFICATION

[JNCIE-SP](#), [JNCIP-SP](#), [JNCIS-SP](#), [JNCIA-SP](#)

### RELATED JUNIPER PRODUCTS

EX Series, JSA Series, Junos OS, MX Series, Network Design

### RECOMMENDED NEXT COURSE

[Junos Layer 3 VPNs \(JL3V\)](#)

### 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.
- Explain OSPF link metrics.
- Describe the various OSPF authentication methods.
- Explain the key differences between OSPFv2 and OSPFv3.
- Describe OSPF area types and operations.
- Configure various OSPF area types.
- Summarize and restrict routes.
- Configure OSPF virtual links.
- Configure OSPF multiarea adjacencies.
- Explain OSPF external reachability.
- List useful commands that are used to troubleshoot and verify OSPF.
- Isolate different OSPF issues.
- Evaluate the OSPFv3 database and routers.
- Explain the concepts and operation of IS-IS.
- Describe various IS-IS link-state protocol data unit (LSP) types.
- List IS-IS adjacency rules and troubleshoot common adjacency issues.
- Configure and monitor IS-IS.

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- Display and interpret the link-state database (LSDB).
- Perform advanced IS-IS configuration options.
- Implement IS-IS routing policies.
- Explain the default operation in multilevel IS-IS.
- Describe address summarization methods used in IS-IS.
- Configure and monitor a multilevel IS-IS network.
- List useful commands to troubleshoot and verify IS-IS problems.
- Troubleshoot and isolate different IS-IS issues.
- Describe basic BGP operations.
- List common BGP attributes.
- Explain the route selection process for BGP.
- Describe how to alter the route selection process.
- Configure advanced options for BGP peers.
- Explain how policies function in BGP.
- Describe BGP attributes and explain how these attributes can be used to manipulate traffic.
- Describe the BGP attributes origin, multiple exit discriminator (*MED*), and communities, and explain the operation of those attributes.
- Manipulate BGP attributes using routing policy.
- Describe the operation of BGP route reflection.
- Configure a route reflector.
- Describe the BGP virtual route reflector.
- Explain the operation of optimal route reflection.
- Describe the workings of a BGP confederation.
- Configure confederations.
- Describe peering relationships in a confederation.
- Identify what is route flap and route damping.
- Describe distributed denial of service (DDoS) mitigation techniques using damping parameters.
- Explain the default behavior of damping on links.
- Control damping using routing policy.
- Review common BGP troubleshooting procedures.
- List common BGP troubleshooting commands.
- Identify issues with BGP peering.
- Isolate problems on routing policy structure and configuration.
- Identify common commands for troubleshooting routing policy.
- Explain the causes for route instability.

## COURSE CONTENTS

### DAY 1

#### Module 1: Introduction

#### Module 2: OSPF

- Review the basics of OSPFv2
- Explain how link-state advertisements work
- Describe the different protocol operations
- Explain how OSPF authentication works

#### Lab 1: OSPF Multiarea Networks

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## Module 3: OSPF Areas

- Review OSPF areas
- Explain how stub areas operate
- Review stub area configuration
- Explain how NSSA operates
- Review NSSA configuration
- Describe route summarization

### Lab 2: OSPF Route Summarization

## Module 4: OSPF Case Studies and Solutions

- Configure OSPF virtual links
- Configure OSPF multiarea adjacencies
- Explain OSPF external reachability

### Lab 3: Advanced OSPF Options and Routing Policy

Day 2

## Module 5: OSPF Troubleshooting

- Identify OSPF neighbors and routing issues
- Examine the OSPFv3 database and routers

### Lab 4: Troubleshooting OSPF

## Module 6: IS-IS

- Explain the concepts and operation of IS-IS
- Describe various IS-IS link-state PDU types
- List IS-IS adjacency rules and troubleshoot common adjacency issues
- Configure and monitor IS-IS

### Lab 5: IS-IS Configuration and Monitoring

## Module 7: Advanced IS-IS Operations and Configuration Options

- Present and interpret the IS-IS LSDB
- Identify advanced IS-IS configurations
- Implement IS-IS routing policies

### Lab 6: Advanced IS-IS Configuration Options and Routing Policies

Day 3

## Module 8: Multilevel IS-IS Networks

- Explain the default operation in a multilevel IS-IS network
- Describe address summarization methods used in IS-IS
- Review a route leaking and summarization case study

### Lab 7: Configuring a Multilevel IS-IS Network

## Module 9: IS-IS Troubleshooting

- Verify and isolate IS-IS problems
- Analyze IS-IS issues by means of a case study

### Lab 8: Troubleshooting IS-IS

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## Module 10: Border Gateway Protocol

- Provide an overview of BGP
- Identify how BGP operates
- Explain BGP path selection and options
- Describe BGP configuration options

### Lab 9: BGP and BGP Attributes

Day 4

## Module 11: BGP Attributes and Policy, Part 1

- Describe BGP policy
- Explain how the BGP next hop works
- Evaluate the basics of origin and MED
- Review BGP AS path

### Lab 10: BGP Attributes—Next Hop, Origin, MED, and AS Path

## Module 12: BGP Attributes and Policy, Part 2

- Describe the BGP attributes local preference
- Manipulate BGP attributes using routing policy

### Lab 11: BGP Attributes—Local Preference and Communities

## Module 13: Route Reflection and Confederations

- Describe the BGP route reflection operation
- Examine route reflection configuration
- Configure BGP confederations

### Lab 12: Scaling BGP

Day 5

## Module 14: BGP Route Damping

- Explain the purpose of route flap and damping
- Identify damping parameters
- Configure and monitor route damping

### Lab 13: BGP Route Damping

## Module 15: BGP Troubleshooting

- Identify IBGP troubleshooting tasks
- Recognize different EBGP and BGP issues

### Lab 14: Troubleshooting BGP

## Module 16: Policy Troubleshooting

- Assess the basics of routing policy
- Review policy structure
- Evaluate the use of regular expressions
- Identify useful troubleshooting commands
- Review various case studies

### Lab 15: Troubleshooting Routing Policy

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