



Cisco CCNP

ROUTE: Implementing Cisco IP Routing (ROUTE) 2.0

Implementing Cisco IP Routing (ROUTE) v2.0 is an instructor-led five day training course developed to help students prepare for Cisco CCNP certification. The ROUTE course is a component of the CCNP Routing and Switching curriculum. This live class is available virtually with [Remotelive™](#) or locally at our Phoenix, AZ location.

\$3,595.00

- 5 Days
- Cisco CCNP Routing and Switching curriculum track

Upcoming Dates

Course Description

This course is designed to provide professionals working with medium to large networks with the skills and knowledge required to incorporate advanced routing concepts when implementing scalability for Cisco routers that are connected to LANs and WANs. Students will build upon the knowledge and skills from CCNA Routing and Switching and help expand competencies to plan, implement, and monitor a scalable routing network.

The overall design of the new ROUTE training is now heavily focused on lab-based learning. Some older topics have been removed or simplified from ROUTE v1.0, while several new IPv6 routing topics have been added. The course content has been adapted to Cisco IOS Software Release 15 and technically updated.

Course Outline

Module 1: Basic Network and Routing Concepts

Lesson 1: Differentiating Routing Protocols

- Enterprise Network Infrastructure
- Role of Dynamic Routing Protocols
- Choosing the Optimal Routing Protocol
- IGP vs. EGP
- Types of Routing Protocols
- Convergence
- Route Summarization
- Routing Protocol Scalability

Lesson 2: Understanding Network Technologies

- Traffic Types
- IPv6 Address Types
- Network Types
- Nonbroadcast Multiple
- Access Networks

- Routing over the Internet

Lesson 3: Connecting Remote Locations with the Headquarters

- Connectivity Overview
- Routing Across MPLS VPNs
- Routing over a GRE Tunnel
- Dynamic Multipoint Virtual Private Network
- Multipoint GRE
- Next Hop Resolution Protocol
- IPsec

Lesson 4: Implementing RIPng

- RIP Overview
- Discovery 1: Configuring RIPng
- Investigating the RIPng Database

Challenge Lab 1: Configure RIPng

Module 2: EIGRP Implementation

Lesson 1: Establishing EIGRP Neighbor Relationships

- EIGRP Features
- EIGRP Reliable Transport
- EIGRP Operation Overview
- Discovery 2: Configuring and Investigating
- Basic EIGRP
- Manipulating EIGRP Timers
- EIGRP Neighborhood over Frame Relay
- Establishing EIGRP over Layer 3 MPLS VPN
- EIGRP Neighborhood over Layer 2 MPLS VPN

Lesson 2: Building the EIGRP Topology Table

- Discovery 3: Building the EIGRP Topology Table
- Exchange of Routing Knowledge in EIGRP
- EIGRP Metric
- EIGRP Metric Calculation
- EIGRP Metric Calculation Example
- The Feasibility Condition
- EIGRP Path Calculation Example

Lesson 3: Optimizing EIGRP Behavior

- EIGRP Queries
- EIGRP Stub Routers
- Discovery 4: EIGRP Stub Routing
- Stuck in Active
- Reducing Query Scope by Using Summary Routes
- Discovery 5: EIGRP Summarization
- Load Balancing with EIGRP
- Discovery 6: EIGRP Load Balancing

Challenge Lab 2: Configure EIGRP

Lesson 4: Configuring EIGRP for IPv6

- EIGRP for IPv6 Overview
- Discovery 7: EIGRP for IPv6 Configuration
- Verifying EIGRP for IPv6 Configuration

Challenge Lab 3: Configure and Optimize EIGRP for IPv6

Lesson 5: Discovering Named EIGRP Configuration

- Introduction to Named EIGRP Configuration
- Discovery 8: Discovering the Named EIGRP Configuration
- Named EIGRP Configuration Modes
- Example: Classic vs. Named EIGRP Configuration

Challenge Lab 4: Implement EIGRP for IPv4 and IPv6 Through Named Configuration

Module 3: OSPF Implementation

Lesson 1: Establishing OSPF Neighbor Relationships

- OSPF Features
- OSPF Operation Overview
- Hierarchical Structure of OSPF
- Design Limitations of OSPF
- OSPF Message Types
- Discovery 9: Basic OSPF Configuration Introduction
- OSPF Neighborship over Point-to-Point Links
- OSPF Neighborship on Layer 3 MPLS VPN
- OSPF Neighborship over Layer 2 MPLS VPN
- OSPF Neighbor States
- OSPF Network Types
- Configuring Passive Interfaces

Lesson 2: Building the Link-State Database

- OSPF LSA Types
- Discovery 10: Building the Link-State Database
- Periodic OSPF Database Changes
- Exchanging and Synchronizing LSDBs
- Synchronizing LSDB on Multiaccess Networks
- Running the SPF Algorithm
- Discovery 11: OSPF Path Selection
- Calculating the Cost of Intra-Area Routes
- Calculating the Cost of Interarea Routes
- Selecting Intra-Area and Interarea Routes

Challenge Lab 5: Configure OSPF

Lesson 3: Optimizing OSPF Behavior

- OSPF Route Summarization

- Benefits of Route Summarization
- Discovery 12: OSPF Route Summarization
- Summarization on ABRs
- Summarization on ASBRs
- Two Ways of Directing Traffic to the Internet
- Discovery 13: OSPF Stub Areas
- Cost of the Default Route in a Stub Area
- The default-information originate Command
- Other Stubby Area Types

Challenge Lab 6: Optimize OSPF

Lesson 4: Configuring OSPFv3

- Discovery 14: Implementing OSPFv3
- Configuring Advanced OSPFv3
- OSPFv3 Caveats

Challenge Lab 7: Configure OSPFv3

Module 4: Configuration of Redistribution

Lesson 1: Implementing Basic Routing Protocol Redistribution

- The Need for Redistribution
- Defining Route Redistribution
- Redistributing Route Information
- Default Metrics for Redistributed Routes
- Discovery 15: Basic Redistribution
- Calculating Costs for OSPF E1 and E2 Routes
- Types of Redistribution
- Mutual Redistribution

Lesson 2: Manipulating Redistribution Using Route Filtering

- The Need for Redistribution Manipulation
- Distribute Lists
- Distribute Lists Usage
- Prefix Lists
- Prefix List Example
- Discovery 16: Manipulate Redistribution
- Introducing Route Maps
- Route Map Applications
- Route Map Operation
- Configuring Route Maps
- Route Maps Example
- Discovery 17: Manipulate Redistribution Using Route Maps
- Changing Administrative Distance
- Manipulating Redistribution Using Route Tagging
- Caveats of Redistribution

Challenge Lab 8: Implement Redistribution Using Route Filtering

Module 5: Path Control Implementation

Lesson 1: Using Cisco Express Forwarding Switching

- Control Plane and Data Plane
- Cisco Switching Mechanisms
- Process Switching and Fast Switching
- Cisco Express Forwarding
- Discovery 18: Analyzing Cisco Express Forwarding

Lesson 2: Implementing Path Control

- Need for Path Control
- PBR Features
- PBR Benefits
- Configuring PBR
- Discovery 19: Implementing PBR
- Need for Dynamic Path Control
- Cisco IOS IP SLA
- Configuring IP SLA
- Using IP SLA for Path Control

Challenge Lab 9: Implement Path Control

Module 6: Enterprise Internet Connectivity

Lesson 1: Planning Enterprise Internet Connectivity

- Enterprise Internet Connectivity Needs
- Types of ISP Connectivity
- Public IP Address Assignments
- Provider-Independent IP Addressing
- AS Numbers

Lesson 2: Establishing Single-Homed IPv4 Internet Connectivity

- Configuring a Provider-Assigned IPv4 Address
- Obtaining a Provider-Assigned IPv4 Address with DHCP
- Need for NAT
- NAT Overview
- Configuring Static NAT
- Configuring Dynamic NAT
- Configuring PAT
- Limitations of NAT
- NAT Virtual Interface
- Discovery 20: Configuring NAT Virtual Interface

Lesson 3: Establishing Single-Homed IPv6 Internet Connectivity

- Obtaining Provider-Assigned IPv6 Addresses
- Discovery 21: Basic IPv6 Internet Connectivity
- Securing IPv6 Internet Connectivity

Lesson 4: Improving Resilience of Internet Connectivity

- Drawbacks of a Single-Homed Internet Connectivity
- Dual-Homed Internet Connectivity
- Configuring Best Path for Dual-Homed Internet Connectivity
- Multihomed Internet Connectivity
- Multihoming Options

Lesson 5: Considering Advantages of Using BGP

- Routing Between Autonomous Systems
- Path Vector Functionality
- BGP Routing Policies
- Characteristics of BGP
- BGP Data Structures
- BGP Message Types
- When to Use BGP

Lesson 6: Implementing Basic BGP Operations

- BGP Neighbor Relationships
- EBGP Neighbor Relationships
- IBGP Neighbor Relationships
- Basic BGP Configuration Requirements
- Configuring BGP Neighbors
- Discovery 22: Basic BGP Configuration

Lesson 7: Using BGP Attributes and the Path Selection Process

- BGP Path Selection
- BGP Route Selection Process
- Weight Attribute
- Configuring the Default Weight for a Neighbor
- Configuring Weight with Route Maps

Discovery 23: Influencing BGP Path Selection

- MED Attribute
- Setting MED with a Route Map

Lesson 8: Controlling BGP Routing Updates

- Filtering of BGP Routing Updates
- Using Prefix Lists to Filter BGP Updates
- Implementing AS Path Access Lists
- Using Route Maps to Manipulate BGP Updates
- Route Map Use Case Example
- Filtering Order
- Clearing the BGP Session
- BGP Peer Groups
- Peer Group Configuration Scenario
- Peer Group Configuration Example

Challenge Lab 10: Configure BGP

Lesson 9: Implementing BGP for IPv6 Internet Connectivity

- MP-BGP Support for IPv6
- Exchanging IPv6 Routes over an IPv4 Session
- Exchanging IPv6 Routes over an IPv6 Session
- Discovery 24: BGP for IPv6
- Comparing Single and Dual BGP Transport
- IPv6 BGP Filtering Mechanisms
- IPv6 Prefix List Filtering
- IPv6 Path Selection with BGP Local Preference

Module 7: Routers and Routing Protocol Hardening

Lesson 1: Securing Cisco Routers

- Securing Cisco IOS Routers Checklist
- Router Security Policy
- Encrypted Passwords
- Use SSH Instead of Telnet
- Securing Access to the Infrastructure Using
- Router ACLs
- Secure SNMP
- Configuration Backups
- Implement Logging
- Disable Unused Services

Lesson 2: Describing Routing Protocol Authentication Options

- The Purpose of Routing Protocol Authentication
- Authentication Types
- Plaintext Authentication Process
- Hashing Authentication Process
- Time-Based Key Chains
- Authentication Options with Different Routing Protocols

Lesson 3: Configuring EIGRP Authentication

- EIGRP Authentication Configuration Checklist
- Discovery 25: Configuring EIGRP Authentication
- EIGRP for IPv6 Authentication Configuration
- EIGRP for IPv6 Authentication Verification
- Configuring Authentication in Named EIGRP

Challenge Lab 11: Configure Authentication for EIGRP Routes

Lesson 4: Configuring OSPF Authentication

- OSPF Authentication Configuration Checklist
- Discovery 26: OSPF Authentication Configuration

Lesson 5: Configuring BGP Authentication

- BGP Authentication Configuration Checklist
- BGP Authentication Configuration
- BGP Authentication Verification

- BGP for IPv6 Authentication Configuration
- BGP for IPv6 Authentication Verification

Challenge Lab 12: Configure BGP Authentication

Lab Outline:

There are 2 different types of labs being used to aid learning. Discovery labs are instructor guided labs through which students explore new topics in an interactive way. Challenge labs are designed to test students understanding of the topics being taught and to provide vital hands-on practice.

- Discovery 1: Configuring RIPv6
- Discovery 2: Configuring and Investigating Basic EIGRP
- Discovery 3: Building The EIGRP Topology Table
- Discovery 4: EIGRP Stub Routing
- Discovery 5: EIGRP Summarization
- Discovery 6: EIGRP Load Balancing
- Discovery 7: EIGRP for IPv6 Configuration
- Discovery 8: Discovering Named EIGRP Configuration
- Discovery 9: Basic OSPF Configuration Introduction
- Discovery 10: Building the Link-State Database
- Discovery 11: OSPF Path Selection
- Discovery 12: OSPF Route Summarization
- Discovery 13: OSPF Stub Areas
- Discovery 14: Implementing OSPFv3
- Discovery 15: Basic Redistribution
- Discovery 16: Manipulate Redistribution
- Discovery 17: Manipulate Redistribution Using Route Maps
- Discovery 18: Analyzing CEF
- Discovery 19: Implementing PBR
- Discovery 20: NAT Virtual Interface
- Discovery 21: Basic IPv6 Internet Connectivity
- Discovery 22: Basic BGP Configuration
- Discovery 23: Influencing BGP Path Selection
- Discovery 24: BGP for IPv6
- Discovery 25: Configuring EIGRP Authentication
- Discovery 26: OSPF Authentication Configuration

Challenges:

- Challenge 1: Configure RIPv6
- Challenge 2: Configure EIGRP
- Challenge 3: Configure and Optimize EIGRP for IPv6
- Challenge 4: Implement EIGRP for IPv4 and IPv6 Through Named Configuration
- Challenge 5: Configure OSPF
- Challenge 6: Optimize OSPF
- Challenge 7: Configure OSPFv3
- Challenge 8: Implement Redistribution Using Route Filtering
- Challenge 9: Implement Path Control
- Challenge 10: Configuring BGP
- Challenge 11: Configure Authentication for EIGRP Routes
- Challenge 12: Configure BGP Authentication

Audience

This course is appropriate for learners who aim to be network professionals and who have knowledge obtained from Cisco CCNA courses. Typical job roles include network engineers, support engineers, systems engineers or network technicians.

Prerequisites

The knowledge and skills that a learner should have before attending this curriculum are as follows:

- Describing network fundamentals
- Establishing Internet and WAN connectivity (IPv4 and IPv6)
- Managing network device security
- Operating a medium-sized LAN with multiple switches, supporting VLANs, trunking, and spanning tree
- Troubleshooting IP connectivity (IPv4 and IPv6)
- Configuring and troubleshooting EIGRP and OSPF (IPv4 and IPv6)
- Configuring devices for SNMP, syslog, and NetFlow access
- Managing Cisco device configurations, Cisco IOS images, and licenses

It is highly recommended that this course be taken after the following Cisco courses:

[Interconnecting Cisco Networking Devices v2.0, Part 1 \(ICND1 v2.0\)](#) and [Part 2 \(ICND2 v2.0\)](#), or

[Interconnecting Cisco Networking Devices: Accelerated Version 2.0 \(CCNAX v2.0\)](#).

What You Will Learn

After completing this course, students will be able to...

- Describe routing protocols, different remote connectivity options, and their impact on routing and implementing RIPv6
- Configure EIGRP in IPv4 and IPv6 environments
- Configure OSPF in IPv4 and IPv6 environments
- Implement route redistribution using filtering mechanisms
- Implement path control using policy-based routing and IP SLA
- Implement enterprise Internet connectivity
- Secure Cisco routers according to best practices and configure authentication for routing protocols