



Route v2.0 Implementing Cisco IP Routing

Part of CCNP & CCDP Route/Switch

Course Length: 5 days

Course Delivery: Traditional Classroom • Online Live

Course Overview

ROUTE v2.0, a five-day ILT course, includes major updates and follows an updated blueprint. (However, note that this course does not cover all items listed on the blueprint.) Some older topics have been removed or simplified, while several new IPv6 routing topics have been added. The course content has been adapted to Cisco IOS Software Release 15 and technically updated.

The goal of the course is to build upon the knowledge and skills from CCNA Routing and Switching and help you expand competencies to plan, implement, and monitor a scalable routing network.

Audience

Learners who aim to be network professionals and who have knowledge that is obtained from Cisco CCNA courses

Prerequisites

This section lists the skills and knowledge that learners must possess to benefit fully from the curriculum. It includes recommended Cisco learning offerings that the learners may complete to benefit fully from this curriculum.

The knowledge and skills that a learner must have before attending this course 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)



At the end of this training course, you'll be able to:

- Describe routing protocols, different remote connectivity options, and their impact on routing and implementing RIPng
- 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

Outline

Course Introduction

- Overview
- Course Goal and Objectives
- Course Flow
- Additional References
- Your Training Curriculum

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



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- 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
- Investigating the RIPng Database

Module 2: EIGRP Implementation

Lesson 1: Establishing EIGRP Neighbor Relationships

- EIGRP Features
- EIGRP Reliable Transport
- EIGRP Operation Overview
- Manipulating EIGRP Timers
- EIGRP Neighborship over Frame Relay
- Establishing EIGRP over Layer 3 MPLS VPN
- EIGRP Neighborship over Layer 2 MPLS VPN

Lesson 2: 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



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- EIGRP Queries
- EIGRP Stub Routers
- Stuck in Active
- Reducing Query Scope by Using Summary Routes
- Load Balancing with EIGRP

Lesson 4: Configuring EIGRP for IPv6

- EIGRP for IPv6 Overview
- Verifying EIGRP for IPv6 Configuration

Lesson 5: Discovering Named EIGRP Configuration

- Introduction to Named EIGRP Configuration
- Named EIGRP Configuration Modes
- Example: Classic vs. Named EIGRP 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
- 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
- Periodic OSPF Database Changes
- Exchanging and Synchronizing LSDBs
- Synchronizing LSDB on Multiaccess Networks
- Running the SPF Algorithm
- Calculating the Cost of Intra-Area Routes
- Calculating the Cost of Interarea Routes



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- Selecting Intra-Area and Interarea Routes

Lesson 3: Optimizing OSPF Behavior

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

Lesson 4: Configuring OSPFv3

- Configuring Advanced OSPFv3
- OSPFv3 Caveats

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
- 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
- Introducing Route Maps
- Route Map Applications
- Route Map Operation
- Configuring Route Maps
- Route Maps Example



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- Changing Administrative Distance
- Manipulating Redistribution Using Route Tagging
- Caveats of Redistribution

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

Lesson 2: Implementing Path Control

- Need for Path Control
- PBR Features
- PBR Benefits
- Configuring PBR
- Need for Dynamic Path Control
- Cisco IOS IP SLA
- Configuring IP SLA
- Using IP SLA for 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



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- Limitations of NAT
- NAT Virtual Interface

Lesson 3: Establishing Single-Homed IPv6 Internet Connectivity

- Obtaining Provider-Assigned IPv6 Addresses
- 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

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



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- Configuring Weight with Route Maps
- 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

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
- 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



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- 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
- EIGRP for IPv6 Authentication Configuration
- EIGRP for IPv6 Authentication Verification
- Configuring Authentication in Named EIGRP

Lesson 4: Configuring OSPF Authentication

- OSPF Authentication Configuration Checklist

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

Lab Outline

- Discovery 1: Configuring RIPng
- 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 the 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 Cisco Express Forwarding
Discovery 19: Implementing PBR
Discovery 20: Configuring 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

Challenge 1: Configure RIPng
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: Configure BGP
Challenge 11: Configure Authentication for EIGRP Routes
Challenge 12: Configure BGP Authentication

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