

## Routing and Switching Fundamentals Series Training

5 Sessions –

15 Hours of Interactive On Line Training

And

## Routing and Switching Fundamentals Part II Training

4 Sessions –

12 Hours of Interactive On Line Training

The Routing and Switching Fundamentals Series from ExamForce has in one package the training courses a certification candidate needs to successfully complete both ICND1® and ICND2®, providing more than 29 hours of instruction by expert Tom Carpenter. At the conclusion of this instruction, you will be confident in your ability to master the CCENT and CCNA exams.

### Benefits

- Gain a competitive edge with the Cisco CCENT and Cisco CCNA exams.
- You will increase your earning potential with your proven IT credibility.
- ExamForce courses meet the requirements to pass 640-822 ICND1® and 640-816 ICND2®.

### Routing and Switching Fundamentals Part I

#### Session 1

Section A: Introduction

- Series Objectives
- Icons and Symbols

Section B: Computer Networking Concepts

- What is a Network?
- Common Physical Components
- Resource Sharing
- User Applications
- Administration Applications
- Characteristics of a Network

Section C: Overview of OSI Model and TCP/IP

- Why a Layered Model?
- The Seven Layers
- Encapsulating Data
- Peer-to-Peer Communication
- Evolution of TCP/IP
- Mapping TCP/IP to OSI

Section D: TCP/IP Transport and Applications

- Protocol Characteristics
- IP Packet Delivery
- IP Datagram Header
- Protocol Field
- ICMP
- ARP
- DHCP and DNS
- TCP/IP Conversations
- Resolving the MAC Address
- TCP/IP Encapsulation
- Returning a Response
- Network Protocols

Section E: Modern Ethernet LANs

- Ethernet Evolution
- Ethernet Breakdown
- Fast Ethernet
- Gigabit Ethernet

#### Session 2

Section A: Wide Area Networks

- WAN Overview
- Need for WANs
- WAN vs. LAN

Section B: WAN Concepts

- WAN Technologies and Devices
- Physical Layer
- Data-link Protocols
- Link Options
- HDLC and Cisco HDLC
- PPP
- Point-to-Point Considerations

Section C: Transmission Protocols

- Circuit Switching
- PSTN
- ISDN
- Packet Switching
- WAN with X.25
- Frame Relay
- ATM and Cell Switching
- DSL
- Cable-Based WANs
- IP Services for Internet Access

Section D: WAN Configuration

- Configure HDLC
- Verify Data-link Protocol
- Configuring NAT

Section E: Connecting to a Network

- Network Interface Card
- Comparing Media Requirements
- Different Connections
- 1000Base-T GBIC
- Fiber-Optic GBICs
- Unshielded Twisted Pair
- RJ-45 Connector and Jack
- UTP Implementation
- Loops vs. Spanning Tree

Section F: Topologies

- Physical and Logical
- Bus Topology

#### Session 3

Section A: Communications

- Transport Layer
- Reliable vs. Best Effort
- Protocol Characteristics
- Port Numbers
- Transport Headers
- Establishing a Session
- Flow Control
- Fixed vs. Sliding Windows
- TCP Sequence and Acknowledgment
- TCP/IP Applications
- QoS Needs and TCP/IP Application Impact
- WWW, HTTP, and SSL URLs

Section B: IP Addressing

- IP Address Overview
- IP Addressing Classes
- Subnet Mask
- Address Scheme
- Reserved Addresses
- Other Reserved

Section C: Subnetting

- Design Requirements
- Subnetting Example
- Classful Subnetting
- Subnet Calculator
- Determine Scheme
- Subnet Class B
- Mask Subnet
- Block Value

Section D: Routers

- Router Functions
- IP Packet Delivery
- Path Determination
- Routing Tables
- Routing Metrics
- Distance-Vector Protocols
- Link-State Protocols

Section E: IP Routing Concepts

- Route Determination

- 10G Ethernet
- CSMA/CD
- LAN Standards
- Ethernet UTP Cabling

#### Section F: Ethernet Frame Structure

- MAC Address
- Frame Structure
- Communicating within the LAN

#### Section G: Conversions

- Base 2 Number System
- Decimal, Binary, Hexadecimal
- Examples

- Star Topology
- Extended Star Topology
- Ring Topology
- Dual-Ring Topology
- Full-Mesh Topology
- Partial-Mesh Topology

#### Section G: Shared Networking

- Challenges
- Causes of Congestion
- Segmentation Solutions
- Bridging vs. Switching
- Microsegmentation
- Half-Duplex vs. Full-Duplex
- Hierarchy of Design
- LAN Ethernet Connectivity

- Known Routes
- Routing Table
- Table Data
- Static Routing
- Dynamic Routing
- Administrative Distance

#### Section F: Static IP Routing

- Implementation
- Show IP Route
- Create Static Route
- Static Route Limits
- Troubleshoot Interface
- Return Traffic Issues
- Additional Routes
- Gateway of Last Resort

#### Section G: Dynamic Routing

- Distance-Vector
- Link-State
- Protocol Selection
- Routing-by-Rumor
- Distance-Vector Loops
- Looping Prevention
- Split Horizon
- Route Poisoning

### Session 4

#### Section A: RIP Protocol

- Characteristics
- Router Determination
- Enable RIP
- Holding Down Updates
- Adding/Verify RIP
- Verify IP Routing
- Show Commands
- Classful Boundary

#### Section B: Troubleshooting RIP

- Traffic Collection
- debug ip rip
- Turn Off Debug
- View Debug Output

#### Section C: Routers and IOS

- Lab Environment
- Internal Components
- Boot Process
- Console Connection
- 2800 Router Boot Process
- 3800 Router Boot Process

#### Section D: IOS Access Commands

- Router Login
- Global Configuration Mode
- Enable Mode Password
- Secret Password
- Access Points
- Password Examples
- Access Point Examples
- Encrypt All Passwords

#### Section E: Basic IOS Commands

- Set Enable Password
- Set Secret Password
- Test Passwords
- Set Console/Aux
- Set Telnet Password
- Set Encryption

#### Section F: IOS Maintenance Commands

- IOS Help
- Terminal Editing
- Display Configuration
- Setup Mode
- Saving Options
- Back Up Configuration

### Session 5

#### Section A: LAN Devices

- Layer 2 Switching
- MAC Address Table
- Layer 3 Routing
- Layer 3 Switching
- Multilayer Switching

#### Section B: Ethernet Switch Configuration

- Catalyst LAN Switches
- Hostname/Password
- Remote Access
- Ethernet Ports
- Port Description
- Port Speed Module

#### Section C: Catalyst Switches

- Initial Startup
- Logging into the Switch
- Command Line Help Facilities
- Configuring the Switch
- Showing Initial Startup

#### Section D: Ethernet Switch

- Troubleshooting
- Network Verification and Troubleshooting
- Cisco Discovery Protocol
- Layer 1 and 2 Interface Status
- Layer 2 Forwarding Path

#### Section E: Fundamentals of Wireless LAN

- Wireless LAN Concepts
- Wireless LAN Standards
- 802.11 Family Protocols
- Deploying WLANs
- Unified Wireless Network Elements

#### Section F: Wireless LAN Security

- WLAN Security Issues
- WLAN Security Standards
- Wireless Security Implementation

#### Section G: Wireless LAN Configurations

- Wireless LAN Setup and Troubleshooting
- WLAN Design, Installation, Configuration
- Lab Demonstrations

### Routing and Switching

#### Fundamentals Part II

##### Session 1

#### Section A: Introduction

- Series Objectives
- Icons and Symbols

#### Section B: VLAN and Trunking

- VLAN Usage
- Segmentation
- Router Gateway
- Router Options
- VLAN Routing Design
- VLAN Campus Design
- Trunking Protocols
- Comparing ISL and 802.1Q

#### Section C: VLAN Trunking Protocol

- VTP
- VTP Modes
- VTP Operation
- VTP Messages
- VTP Pruning

#### Section D: Configuring and Verifying VLANs

- Prerequisites for VLANs
- Other Prerequisites for VLANs
- Creating a VLAN
- Viewing VLANs
- Creating VLANs
- Enabling Trunks
- Configuring VTP Domains
- Assigning Ports

#### Section E: Configuring VLAN Trunking

- Considerations for VLAN Trunking
- Configuring a Trunk
- Verifying Trunking
- Controlling Access to VLANs
- VLAN Access Example

#### Section F: Configuring and Verifying VTP

- Configuring VTP
- Verifying VTP Status
- Reviewing VTP Configuration Commands
- Cautions while Configuring VTP
- Problems with VTP Configuration

- Back Up IOS
- Restore Configuration
- Section G: ID and Interface Commands
  - Change Hostname
  - Banner
  - Access Interface
  - Assign IP Address
  - Changing Hostname
  - Running Configuration
  - Interface Command
  - Troubleshoot Interface
- Section H: Troubleshooting IP Routing
  - A Routing Troubleshooting Scenario

## Session 2

- Section A: Spanning Tree Protocol Enhancements
  - Cisco Enhancements to STP
  - PortFast
  - UplinkFast
  - BackboneFast
  - EtherChannel
  - Configuring EtherChannel
- Section B: Rapid STP
  - RSTP
  - RSTP Types of Links and Edges
  - RSTP Port States
  - RSTP Port Roles
  - RSTP Convergence
  - RSTP Convergence Example
  - Configuring RSTP
- Section C: Per-VLAN Spanning Tree Plus
  - PVST+
  - Using PVST+ for Load Balancing
  - Troubleshooting STP
  - Identifying the Root Switch
  - Identifying the Root Port
  - Determining the Designated Port
- Section D: VLSM and Route Summarization
  - VLSM
  - Requirements for Using VLSM
  - Overlapping VLSM Subnets
  - Designing a Subnetting Scheme
  - Steps to Design a Subnetting Scheme
  - Subnetting Scheme Example
  - Adding a New Subnet
- Section E: Manual Route Summarization
  - Route Summarization
  - Basic Concepts of Route Summarization
  - Central Routing Table
  - Site A and Site B Routing Tables
  - Strategies for Route Summarization
  - Route Summarization Example
- Section F: Autosummarization
  - Route Autosummarization
  - Using Autosummarization
  - Discontiguous Classful Networks
  - Configuring Autosummarization
- Section G: Running IPv6
  - Migrating to IPv6
  - Advantages of Using IPv6

- Section H: Network Environment Management
  - Network Discovery and Management
  - Discovering Neighbors in the Network
  - Managing IOS Image Files
  - Managing Remote Devices
- Section I: Network Security
  - Sources of Security Attacks
  - Network Topology with Firewall
  - Types of Attacks
  - Common Security Risks
  - Tools Used for Security Attacks
  - How Firewalls Work
  - Cisco ASA Appliances
  - IDS and IPS Systems
  - VPNs
  - Types of VPNs

## Session 3

- Section A: Routing Protocols
  - Types of Routing Protocols
  - IGP Routing Protocols
  - Distance-Vector Routing Protocols
  - Link-State Routing Protocols
  - Comparing IGP
- Section B: Open Shortest Path First
  - OSPF
  - Configuring OSPF
  - Configuring OSPF in Single Area
  - Authenticating OSPF
  - Troubleshooting the OSPF Interface
- Section C: Enhanced IGRP
  - EIGRP
  - Steps to Configure EIGRP
  - Configuring EIGRP
  - Authenticating EIGRP
  - Troubleshooting the EIGRP Interface
- Section D: Verifying Connectivity
  - The ping Command
  - Extended ping Command
  - The traceroute Command
  - The telnet and SSH Commands
- Section E: Troubleshooting Routing
  - Isolating IP Routing Problems
  - Isolating IP Routing Problems Example
  - IP Routing Problems Related to Routers
  - Troubleshooting Forward Route Problems
  - Troubleshooting Reverse Route Problems
- Section F: Implementing Basic Router Security
  - Configuring Basic Router Security
  - Implementing Access Security to Router
  - Implementing Route Process Security
  - Logging, NTP, and User LAN Security
  - Basic Router Security Tips

- Configuring Transparent Mode
- Section G: Troubleshooting VTP
  - Troubleshooting Methodologies
  - Identifying VTP Problems
  - Troubleshooting VTP Problems
  - New Switch Connection Problems
  - Troubleshooting New Switch Connections
  - Practices to Avoid VTP Problems
- Section H: Implementing Switch Security
  - Implementing Port Security
  - Configuring and Verifying Port Security
  - Checking for Port Security Problems
  - Troubleshooting Port Security
  - VLAN and Trunking Problems
  - Ensuring Right Access Interface
  - Ensuring Access VLANs are Active
  - Trunks and VLAN Forwarding
  - Troubleshooting the Data Plane

## Session 4

- Section A: Access Control Lists
  - Working with ACLs
  - Filtering Logic
  - Standard IP ACLs
  - Extended IP ACLs
  - Standard vs. Extended IP ACLs
- Section B: Configuring ACLs
  - Standard ACL Command Syntax
  - Extended ACL Command Syntax
  - Deny
  - Permit
  - Denying FTP
  - Assigning ACLs
  - Configuring ACLs
  - Verifying Access
  - Creating Access List
  - Denying Web Access
  - Assigning and Verifying ACL
  - Controlling Telnet and SSH Access
- Section C: Monitoring ACL Configuration
  - Using Named IP Access Lists
  - Using Sequence Numbers to Edit ACLs
  - Edit ACLs Example
- Section D: Access List Troubleshooting
  - Considerations for Implementing ACLs
  - Troubleshooting Access Lists
- Section E: Network Address Translation
  - NAT Address Swapping
  - Static NAT
  - Dynamic NAT
  - Configuring Static NAT
  - Configuring Dynamic NAT
  - Verifying NAT Operations
  - Troubleshooting NAT
- Section F: Fundamentals of Frame Relay
  - Frame Relay
  - Frame Relay Local Addressing
  - Frame Relay Global Addressing
  - Configuring and Verifying Frame Relay
  - Steps to Configure Frame Relay
  - Fully Meshed Network with One IP Subnet
  - Configuring the Encapsulation and LMI
  - Verifying a Frame Relay
- Section G: Point-to-Point Protocol
  - HDLC
  - PPP

- IPv6 Address Conventions
- Conventions for Writing IPv6 Prefixes
- Assigning IPv6 Prefixes

#### Section H: Technological Requirements for IPv6

- IPv6 Routing Protocols
- Configuring IPv6
- IPv4/IPv6 Dual Stacks
- Tunneling
- Types of Tunneling
- Using NAT-PT

#### Section I: Resolving IP Addressing Problems

- IP Address Conflicts
- Resolving IP Conflicts
- Manually Fixing IP Conflicts

- PPP Authentication
- Configuring Basic PPP
- Configuring and Verifying CHAP
- Configuring PAP

#### Section H: Virtual Private Networks

- VPN
- Design Goals of VPN
- Benefits of VPN
- Types of VPNs
- VPN Supporting Devices
- IPsec Encryption
- IPsec Key Exchange
- Considerations for Implementing IPsec

#### Section I: WAN Implementation Issues

- Problems in Frame Relay WANs
- Possible Causes of WAN Problems
- Resolving WAN Problems
- Resolving Frame Relay WAN Problems