CCNA ROUTING & SWITCHING
COURSE SYLLABUS

Module 1: Building a Simple Network

Lesson 1: Exploring the Functions of Networking

- What Is a Network?
- Physical Components of a Network
- Interpreting a Network Diagram
- Impact of User Applications on the Network
- Characteristics of a Network
- Physical vs. Logical Topologies

Lesson 2: Understanding the Host-to-Host Communications Model

- Introducing Host-to-Host Communications
- OSI Reference Model
- TCP/IP Protocol Suite
- Encapsulation and De-Encapsulation
- Peer-to-Peer Communications

Lesson 3: Introducing LANs

- Local Area Networks
- LAN Components
- Need for Switches
- Switches Summary

Lesson 4: Operating Cisco IOS Software

- Cisco IOS Software Features and Functions
- Cisco IOS CLI Functions
- User EXEC Mode
- Privileged EXEC Mode
- Help Functions in the CLI
- CLI Error Messages
- Managing Cisco IOS Configurations
- Improving the User Experience in the CLI

Lesson 5: Starting a Switch
- Switch Installation
- Switch LED Indicators
- Connecting to a Console Port
- Basic Switch Configuration
- Verifying the Switch Initial Startup Status

Lesson 6: Understanding Ethernet and Switch Operation
- Ethernet LAN Connection Media
- Ethernet Frame Structure
- MAC Addresses
- Switching Operation
- Duplex Communication
- Configuring Duplex and Speed Options

Lesson 7: Troubleshooting Common Switch Media Issues
- Common Troubleshooting Tools
- Media Issues
- Troubleshooting Switch Media Issues
- Port Issues
- Troubleshooting Port Issues

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Module 2: Establishing Internet Connectivity

Lesson 1: Understanding the TCP/IP Internet Layer
- Internet Protocol
- IPv4 Address Representation
- IPv4 Header Address Fields
- Decimal and Binary Systems

- Decimal-to-Binary Conversion
- IP Address Classes
- Reserved IPv4 Addresses
- Domain Name System
  - Verifying the IPv4 Address of a Host

Lesson 2: Understanding IP Addressing and Subnets
- Subnets
- Subnet Masks
- Octet Values of a Subnet Mask
- Computing Usable Subnetworks and Hosts Applying Subnet Masks
- Determining the Network Addressing Scheme VC Interactivity: Host Address
- Variable-Length Subnet Mask VLSM Example

Lesson 3: Understanding the TCP/IP Transport Layer
- TCP/IP Transport Layer Functions
- Reliable vs. Best-Effort Transport
- TCP vs. UDP Analogy
- UDP Characteristics
- TCP Characteristics
- TCP/IP Applications

Lesson 4: Exploring the Functions of Routing
- Role of a Router
- Router Characteristics
- Router Functions
- Path Determination
- Types of Routes
- Dynamic Routing Protocols

Lesson 5: Configuring a Cisco Router

- Initial Router Startup
- Initial Router Setup
- Configuring Router Interfaces
- Configuring the Cisco Router IP Address
- Verifying Interface Configuration and Status
- Exploring Connected Devices
- Cisco Discovery Protocol
- Discovering Neighbors Using Cisco Discovery Protocol

Lesson 6: Exploring the Packet Delivery Process
- Layer 2 Addressing
- Layer 3 Addressing
- Host-to-Host Packet Delivery
- Role of a Switch in Packet Delivery

Lesson 7: Enabling Static Routing
- Routing Operations
- Static and Dynamic Routing Comparison
- When to Use Static Routing
- Static Route Configuration
- Default Routes
- Static Route Configuration Verification

Lesson 8: Managing Traffic Using ACLs
- Using ACLs
- ACL Operation
- ACL Wildcard Masking
- Wildcard Bit Mask Abbreviations
- Types of ACLs
- Testing an IP Packet Against a Numbered Standard Access List
- Basic Configuration of Numbered Standard IPv4 ACLs

Lesson 9: Enabling Internet Connectivity
- The Demarcation Point
- Dynamic Host Configuration Protocol

- Options for Configuring a Provider-Assigned IP Address
- Configuring a Static Provider-Assigned IP Address
- Configuring a DHCP Client
- Public vs. Private IPv4 Addresses
- Introducing NAT
- Types of Addresses in NAT
- Types of NAT
- Understanding Static NAT
- Configuring Static NAT
- Verifying Static NAT Configuration
- Understanding Dynamic NAT
- Configuring Dynamic NAT
- Verifying Dynamic NAT Configuration
- Understanding PAT
- Configuring PAT
- Verifying PAT Configuration
- Troubleshooting NAT ▪ Troubleshooting NAT Case Study

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Module 3: Managing Network Device Security

Lesson 1: Securing Administrative Access
- Network Device Security Overview
- Securing Access to Privileged EXEC Mode
- Securing Console Access
- Securing Remote Access
- Enabling Remote Access Connectivity
- Limiting Remote Access with ACLs
- External Authentication Options
- Configuring the Login Banner

Lesson 2: Implementing Device Hardening
- Securing Unused Ports
- Port Security

- Port Security Configuration
- Port Security Verification
- Disabling Unused Services
- Network Time Protocol
- Configuring NTP
- Verifying NTP
- VC Interactivity: Network Time Protocol

Lesson 3: Implementing Traffic Filtering with ACLs
- Using ACLs to Filter Network Traffic
- ACL Operation
- The Need for Extended ACLs
- Configuring Numbered, Extended IPv4 ACLs
- Configuring Named ACLs
- ACL Configuration Guidelines
- Monitoring ACLs
- Troubleshooting Common ACL Errors

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Module 4: Introducing IPv6
Lesson 1: Introducing Basic IPv6
- IPv4 Addressing Exhaustion Workarounds IPv6

Features
- IPv6 Addresses
- IPv6 Unicast Addresses
- IPv6 Addresses Allocation
- Basic IPv6 Connectivity
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Lesson 2: Understanding IPv6
- IPv6 Header Changes and Benefits
- ICMPv6
- Neighbor Discovery

- Stateless Autoconfiguration

Lesson 3: Configuring IPv6 Routing
- Routing for IPv6
- Static Routing

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Module 5: Building a Medium-Sized Network

Lesson 1: Implementing VLANs and Trunks
- Issues in a Poorly Designed Network
- VLAN Introduction
- Trunking with 802.1Q
- Creating a VLAN
- Assigning a Port to a VLAN
- Configuring an 802.1Q Trunk
- VLAN Design Considerations

Lesson 2: Routing Between VLANs
- Purpose of Inter-VLAN Routing
- Options for Inter-VLAN Routing

Lesson 3: Using a Cisco Network Device as a DHCP Server
- Need for a DHCP Server
- Understanding DHCP
- Configuring a DHCP Server
- Monitoring DHCP Server Functions
- DHCP Relay Agent

Lesson 4: Troubleshooting VLAN Connectivity
- Dynamic Trunking Protocol
- VLAN Troubleshooting
- Trunk Troubleshooting

Lesson 5: Building Redundant Switched Topologies

- Issues in Redundant Topologies
- Spanning-Tree Operation
- Types of Spanning-Tree Protocols
- Per VLAN Spanning Tree Plus
- Modifying the Bridge ID
- Analyzing the STP Topology
- Spanning-Tree Failure Consequences
- PortFast and BPDU Guard

Lesson 6: Improving Redundant Switched Topologies with EtherChannel

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- Advantages of EtherChannel
- EtherChannel Protocols
- Configuring EtherChannel
- Verifying EtherChannel Summary

Lesson 7: Understanding Layer 3 Redundancy

- The Need for Default Gateway Redundancy
- Default Gateway Redundancy
- HSRP
- HSRP Interface Tracking
- HSRP Load Balancing
- Gateway Load Balancing Protocol

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Module 6: Troubleshooting Basic Connectivity

Lesson 1: Troubleshooting IPv4 Network Connectivity

- Components of Troubleshooting End-to-End

Connectivity
- Verification of End-to-End Connectivity
- Verification of Physical Connectivity Issue
- Identification of Current and Desired Path
- Default Gateway Issues
- Name Resolution Issues
- ACL Issues

Lesson 2: Troubleshooting IPv6 Network Connectivity
- Troubleshooting End-to-End IPv6 Connectivity
- Verification of End-to-End IPv6 Connectivity
- Identification of Current and Desired IPv6 Path
- Default Gateway Issues in IPv6
- Name Resolution Issues in IPv6
- ACL Issues in IPv6

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Module 7: Wide Area Networks

Lesson 1: Understanding WAN Technologies
- Introducing WANs
- WANs vs. LANs
- WAN Devices
- Role of Routers in WANs
- Serial WAN Cabling
- WAN Layer 2 Protocols
- WAN Link Options

Lesson 2: Configuring Serial Encapsulation
- Point-to-Point Connectivity
- Configuring a Point-to-Point Link
- Serial Communication Links
- Configuration of a Serial Interface
- HDLC Protocol
- Point-to-Point Protocol

- PPP Configuration
- PPP Authentication: PAP
- PPP Authentication: CHAP
- Configuring CHAP for PPP Authentication
- Verifying CHAP Configuration
- Troubleshooting Serial Connections

Lesson 3: Establishing a WAN Connection Using Frame Relay
- Understanding Frame Relay
- Frame Relay Topologies
- Frame Relay Reachability Issues
- Frame Relay Signaling
- Frame Relay Address Mappings
- Configuring Frame Relay
- Point-to-Point vs. Multipoint Configuring Point-toPoint Frame Relay Configuring Multipoint Frame Relay

Lesson 4: Introducing VPN Solutions
- VPNs and Their Benefits Cisco SSL VPN Solutions
- Introducing IPsec Summary

Lesson 5: Configuring GRE Tunnels
- GRE Tunnel Overview
- GRE Tunnel Configuration
- GRE Tunnel Verification

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Module 8: Implementing an EIGRPBased Solution
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- Purpose of Dynamic Routing Protocols
- Interior and Exterior Routing Protocols
- Distance Vector and Link-State Routing Protocols
- Administrative Distance

- EIGRP Features
- EIGRP Path Selection ⬚ EIGRP Metric
- EIGRP Configuration
- Verification of EIGRP Configuration
- Load Balancing with EIGRP

Lesson 2: Troubleshooting EIGRP
- Components of Troubleshooting EIGRP
- Troubleshooting EIGRP Neighbor Issues ⬚ Troubleshooting EIGRP Routing Table Issues

Module 9: Implementing a Scalable OSPF-Based Solution

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- Link-State Routing Protocol Data Structures
- Introducing OSPF
- Establishing OSPF Neighbor Adjacencies
- SPF Algorithm
- Building a Link-State Database
- OSPF Area Structure
- Router ID
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- Verifying OSPF Configuration Summary

Lesson 2: Multiarea OSPF IPv4 Implementation
- Single-Area vs. Multiarea OSPF
- Planning for the Implementation of OSPF
- Multiarea OSPF Configuration
- Multiarea OSPF Verification

Lesson 3: Troubleshooting Multiarea OSPF
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- Components of Troubleshooting OSPF
- Troubleshooting OSPF Neighbor Issues
- Troubleshooting OSPF Routing Table Issues
- Troubleshooting OSPF Path Selection

Lesson 4: Examining OSPFv3
- OSPFv3 Key Characteristics
- OSPFv3 Configuration
- OSPFv3 Configuration Verification Summary

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