

Interconnecting Cisco Networking Devices Accelerated (CCNAX)

Course Summary

Description

The Cisco CCNA curriculum includes a third course, Interconnecting Cisco Networking Devices: Accelerated (CCNAX), consisting of Interconnecting Cisco Networking Devices, Part 1 (ICND1) and Interconnecting Cisco Networking Devices, Part 2 (ICND2) content in its entirety, but with the content merged into a single course. Overlapping content between ICND1 and ICND2 is eliminated and content is rearranged for the purpose of the course flow.

Interconnecting Cisco Networking Devices: Accelerated (CCNAX), is an instructor-led training course that teaches learners how to install, operate, configure, and verify a basic IPv4 and IPv6 network, including configuring a LAN switch, configuring an IP router, connecting to a WAN, and identifying basic security threats. Also covers topics in more depth and teaches learners how to perform basic troubleshooting steps in enterprise branch office networks, preparing learners for Cisco CCNA certification.

Key additions to this latest revision include an understanding of Quality of Service (QoS) elements and their applicability, how virtualized and cloud services will interact and impact enterprise networks, and an overview of network programmability with the related controller types and tools that are available to support software defined network architectures.

Also included is the understanding of the interactions and network functions of firewalls, wireless controllers and access points, along with additional focus on IPv6 and basic network security. A full suite of labs have been developed using the virtual IOS environment with flexible topologies that reinforce concepts with hands-on, guided discovery and challenge labs that align to each lesson module.

The 200-125 CCNA Routing and Switching composite exam is a 90 minute, 50 – 60 question assessment that is associated with the CCNA Routing and Switching certification. This exam tests a candidate's knowledge and skills related to network fundamentals, LAN switching technologies, IPv4 and IPv6 routing technologies, WAN technologies, infrastructure services, infrastructure security, and infrastructure management. A free test voucher is included with the class.

Objectives

At the end of this course, students will be able to:

- Describe network fundamentals and build simple LANs
- Establish Internet connectivity
- Manage and secure network devices
- Operate a medium-sized LAN with multiple switches, supporting VLANs, trunking, and spanning tree
- Troubleshoot IP connectivity
- Describe how to configure and troubleshoot EIGRP in an IPv4 environment, and configure EIGRP for IPv6
- Configure and troubleshoot OSPF in an IPv4 environment and configure OSPF for IPv6
- Define characteristics, functions, and components of a WAN
- Describe how device management can be implemented using the traditional and intelligent ways.
- Understand QoS, virtualization and cloud services, and network programmability related to WAN, access and core segments

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Course Summary (cont'd)

- Install, operate, and troubleshoot a medium-sized network, including connecting to a WAN and implementing network security.
- Describe the effects of new technologies such as IoE, IoT, IWAN, and SDN on network evolution

Topics

- Building a Simple Network
- Establishing Internet Connectivity
- Implementing Scalable Medium-Sized Networks
- Introducing IPv6
- Troubleshooting Basic Connectivity
- Implementing Network Device Security
- Implementing an EIGRP-Based Solution
- Implementing a Scalable OSPF-Based Solution
- Implementing Wide-Area Networks
- Network Device Management

Audience

Individuals seeking the Cisco CCNA Routing and Switching certification. CCNAX is a fast-paced course and should only be taken by individuals with some existing networking experience. The course is also appropriate for pre-sales and post-sales network engineers involved in the installation and support of enterprise branch office networks.

This course is designed for Entry Level Network Engineers, Network Administrators, Network Support Technicians or Help Desk Technicians.

Prerequisites

Prior to taking this course, students should have the following:

- Basic computer literacy
- Basic PC operating system navigation skills
- Basic Internet usage skills
- Basic IP address knowledge
- Good understanding of network fundamentals

Duration

Five days

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Course Outline

I. Building a Simple Network

- A. Exploring the Functions of Networking
 - 1. What Is a Computer Network?
 - 2. Physical Components of a Network
 - 3. Characteristics of a Network
 - 4. Physical vs. Logical Topologies
 - 5. Interpreting a Network Diagram
 - 6. Impact of User Applications on the Network
- B. Understanding the Host-to-Host Communications Model
 - 1. Introducing Host-to-Host Communications
 - 2. OSI Reference Model
 - 3. TCP/IP Protocol Suite
 - 4. Peer-to-Peer Communications
 - 5. Encapsulation and De-Encapsulation
- C. Introducing LANs
 - 1. Local Area Networks
 - 2. LAN Components
 - 3. Need for Switches
 - 4. Switches
- D. Operating Cisco IOS Software
 - 1. Cisco IOS Software Features and Functions
 - 2. Cisco IOS CLI Functions
 - 3. Cisco IOS Software Modes

Lab: Get Started with Cisco CLI

- E. Starting a Switch
 - 1. Switch Installation
 - 2. Switch LED Indicators
 - 3. Connecting to a Console Port
 - 4. Basic Show Commands and Information

Lab: Perform Basic Switch Configuration

- F. Understanding Ethernet and Switch Operation
 - 1. Ethernet LAN Connection Media
 - 2. Ethernet Frame Structure
 - 3. MAC Addresses
 - 4. Frame Switching
 - 5. Duplex Communication

Lab: Observe How a Switch Operates

- G. Troubleshooting Common Switch Media Issues
 - 1. Troubleshooting Methods
 - 2. Troubleshooting Tools
 - 3. Troubleshooting Common Switch Media Issues
 - 4. Troubleshooting Common Switch Port Issues

- 5. General Troubleshooting Process

Lab: Troubleshoot Switch Media and Port Issues

II. Establishing Internet Connectivity

- A. Understanding the TCP/IP Internet Layer
 - 1. Internet Protocol
 - 2. IPv4 Address Representation
 - 3. IPv4 Header Address Fields
 - 4. Decimal and Binary Systems
 - 5. Decimal-to-Binary Conversion
 - 6. IP Address Classes
 - 7. Reserved IPv4 Addresses
 - 8. Private vs. Public IP Addresses
 - 9. Domain Name System
 - 10. Verifying the IPv4 Address of a Host
- B. Understanding IP Addressing and Subnets
 - 1. Subnets
 - 2. Subnet Masks
 - 3. Implementing Subnetting: Borrowing Bits
 - 4. Implementing Subnetting: Determining the Addressing Scheme
 - 5. Benefits of VLSM and Implementing VLSM
- C. Understanding the TCP/IP Transport Layer
 - 1. TCP/IP Transport Layer Functions
 - 2. Reliable vs. Best-Effort Transport
 - 3. TCP vs. UDP Analogy
 - 4. TCP Characteristics
 - 5. UDP Characteristics
 - 6. TCP/IP Applications

Lab: Inspect TCP/IP Applications

- D. Exploring the Functions of Routing
 - 1. Role of a Router
 - 2. Router Components
 - 3. Router Function
 - 4. Routing Table
 - 5. Dynamic Routing Protocol
 - 6. Path Determination
 - 7. Route Selection
- E. Configuring a Cisco Router
 - 1. Initial Router Setup
 - 2. Configuring Router Interfaces
 - 3. IP Addresses on Router Interfaces

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Course Outline (cont'd)

4. Checking Interface Configuration and Status
 5. Exploring Connected Devices
 6. Using Cisco Discovery Protocol
 7. Configuring LLDP
 - Lab: Start with Cisco Router Configuration**
 - Lab: Configure Cisco Discovery Protocol**
 - F. Exploring the Packet Delivery Process
 1. Address Resolution Protocol
 2. Default Gateways
 3. Host-to-Host Packet Delivery
 4. Role of a Switch in Packet Delivery
 5. Troubleshooting Common Problems Associated with IP Addressing
 - Lab: Configure Default Gateway**
 - Lab: Exploration of Packet Forwarding**
 - G. Enabling Static Routing
 1. Routing Operation
 2. Static and Dynamic Routing Comparison
 3. When to Use Static Routing
 4. Static Route Configuration
 5. Default Routes
 6. Verifying the Static Route Configuration
 7. Verifying the Default Route Configuration
 - Lab: Configure and Verify Static Routes**
 - H. Learning Basics of ACL
 1. ACL Overview
 2. ACL Operation
 3. ACL Wildcard Masking
 4. Wildcard Bit Mask Abbreviations
 5. Types of ACLs
 6. Testing an IP Packet Against a Numbered Standard Access List
 7. Configuring Standard IPv4 ACLs
 8. Using ACLs to Filter Network Traffic
 9. Applying ACLs to Interfaces
 10. Configuring Named ACLs
 - Lab: Configure and Verify ACLs**
 - I. Enabling Internet Connectivity
 1. Demarcation Point
 2. Provider-Assigned IP Addresses
 3. Public vs. Private IPv4 Addresses
 4. Introducing NAT
 5. Types of Addresses in NAT
 6. Types of NAT
 7. Understanding Static NAT
 8. Configuring and Verifying Static NAT
 9. Understanding Dynamic NAT
 10. Configuring and Verifying Dynamic NAT
 11. Understanding PAT
 12. Configuring and Verifying PAT
 13. Troubleshooting NAT
 - Lab: Configure a Provider-Assigned IP Address**
 - Lab: Configure Static NAT**
 - Lab: Configure Dynamic NAT and PAT**
 - Lab: Troubleshoot NAT**
- III. Summary Challenge**
- A. Establish Internet Connectivity
- Lab: Summary Challenge Lab**
- B. Troubleshoot Internet Connectivity
- Lab: Summary Challenge**
- IV. Implementing Scalable Medium-Sized Networks**
- A. Implementing and Troubleshooting VLANs and Trunks
 1. Enterprise Network Design
 2. Issues in a Poorly Designed Network
 3. VLAN Introduction
 4. Creating a VLAN
 5. Assigning a Port to a VLAN
 6. Trunking with 802.1Q
 7. Configuring an 802.1Q Trunk
 8. Dynamic Trunking Protocol
 9. VLAN Trunking Protocol
 10. VLAN Design Consideration
 - Lab: Configure VLAN and Trunk**
 - Lab: Troubleshoot VLANs and Trunks**
 - B. Building Redundant Switched Topologies
 1. V4 Concept
 2. Physical Redundancy in a LAN
 3. Issues in Redundant Topologies
 4. Loop Resolution with STP
 5. Spanning-Tree Operation
 6. Spanning-Tree Operation Example
 7. Types of Spanning-Tree Protocols
 8. Comparison of Spanning-Tree Protocols
 9. Per VLAN Spanning Tree Plus
 10. PVST+ Extended Bridge ID
 11. PortFast and BPDU Guard

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Course Outline (cont'd)

- 12. Configuring PortFast and BPDU Guard
 - Lab: Configure Root Bridge and Analyze STP Topology**
 - Lab: Troubleshoot STP Issues**
- C. Improving Redundant Switched Topologies with EtherChannel
 - 1. EtherChannel Overview
 - 2. EtherChannel Protocols
 - 3. Discovery Lab 20: Configure and Verify EtherChannel
- D. Routing Between VLANs
 - 1. Purpose of Inter-VLAN Routing
 - 2. Options for Inter-VLAN Routing
 - 3. Discovery Lab 21: Configure a Router on a Stick
- E. Using a Cisco IOS Network Device as a DHCP Server
 - 1. Need for a DHCP Server
 - 2. Understanding DHCP
 - 3. Configuring a DHCP Server
 - 4. Understanding DNS
 - Lab: Configure a Cisco Router as a DHCP Server**
 - Lab: Troubleshoot DHCP Issues**
- F. Understanding Layer 3 Redundancy
 - 1. Need for Default Gateway Redundancy
 - 2. Understanding FHRP
 - 3. Understanding HSRP
 - Lab: Configure and Verify HSRP**
 - Lab: Troubleshoot HSRP**
- G. Implementing RIPv2
 - 1. Overview of Routing Protocols
 - 2. Distance Vector and Link-State Routing Protocols
 - 3. Understanding RIPv2
 - 4. Configure RIPv2
 - 5. Verify RIPv2
 - Lab: Configure and Verify RIPv2**
 - Lab: Troubleshoot RIPv2**
- V. **Introducing IPv6**
 - A. Introducing Basic IPv6
 - 1. IPv4 Addressing Exhaustion Workarounds
 - 2. IPv6 Features
 - 3. IPv6 Addresses
 - 4. IPv6 Address Scopes and Prefixes
 - 5. IPv6 Address Allocation
 - B. Understanding IPv6 Operation
 - 1. Comparison of IPv4 and IPv6 Headers
 - 2. Internet Control Message Protocol Version 6
 - 3. Neighbor Discovery
 - 4. Stateless Address Autoconfiguration
 - Lab: Configure Basic IPv6 Connectivity**
 - C. Configuring IPv6 Static Routes
 - 1. Routing for IPv6
 - 2. Configuring IPv6 Static Routes
 - Lab: Configure IPv6 Static Routes**
- VI. **Troubleshooting Basic Connectivity**
 - A. Troubleshooting IPv4 Network Connectivity
 - 1. Troubleshooting Guidelines
 - 2. Troubleshooting Physical Connectivity Issue
 - 3. Identification of Current and Desired Path
 - 4. Using SPAN for Troubleshooting
 - 5. Troubleshooting Default Gateway Issues
 - 6. Troubleshooting Name Resolution Issue
 - 7. Troubleshooting ACL Issues
 - Lab: Use Troubleshooting Tools**
 - Lab: Configure and Verify IPv4 Extended Access Lists**
 - Lab: Troubleshoot IPv4 Network Connectivity**
 - B. Troubleshooting IPv6 Network Connectivity
 - 1. IPv6 Unicast Addresses
 - 2. Troubleshooting End-to-End IPv6 Connectivity
 - 3. Verification of End-to-End IPv6 Connectivity
 - 4. Identification of Current and Desired IPv6 Path
 - 5. Troubleshooting Default Gateway Issues in IPv6
 - 6. Troubleshooting Name Resolution Issues in IPv6
 - 7. Troubleshooting ACL Issues in IPv6
 - Lab: Configure and Verify IPv6 Extended Access Lists**
 - Lab: Troubleshoot IPv6 Network Connectivity**

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Course Outline (cont'd)

VII. Implementing Network Device Security

- A. Securing Administrative Access
 - 1. Network Device Security Overview
 - 2. Securing Access to Privileged EXEC Mode
 - 3. Securing Console Access
 - 4. Securing Remote Access
 - 5. Limiting Remote Access with ACLs
 - 6. Configuring the Login Banner

Lab: Enhance Security of Initial Configuration

Lab: Limit Remote Access Connectivity

- B. Implementing Device Hardening
 - 1. Securing Unused Ports
 - 2. Port Security
 - 3. Configuring Port Security
 - 4. Verifying Port Security
 - 5. Disabling Unused Services
 - 6. Network Time Protocol
 - 7. Configuring NTP
 - 8. Verifying NTP

Lab: Configure and Verify Port Security

Lab: Configure and Verify NTP

- C. Implementing Advance Security
 - 1. Mitigating Threats at Access Layer
 - 2. External Authentication Options

Lab: Configure External Authentication Using RADIUS and TACACS+

VIII. Implementing an EIGRP-Based Solution

- A. Implementing EIGRP
 - 1. Dynamic Routing Protocols
 - 2. Administrative Distance
 - 3. EIGRP Features
 - 4. EIGRP Path Selection
 - 5. EIGRP Metric
 - 6. EIGRP Load Balancing

Lab: Configure and Verify EIGRP

- B. Implementing EIGRP for IPv6
 - 1. EIGRP for IPv6

Lab: Configure and Verify EIGRP for IPv6

- C. Troubleshooting EIGRP
 - 1. Troubleshooting EIGRP Issues
 - 2. Troubleshooting EIGRP Neighbor Issues
 - 3. Troubleshooting EIGRP Routing Table Issues
 - 4. Troubleshooting EIGRP for IPv6 Issues

Lab: Troubleshoot EIGRP

IX. Summary Challenge

- A. Troubleshooting a Medium-Sized Network

Lab: Summary Challenge

- B. Troubleshooting Scalable Medium-Sized Network

Lab: Summary Challenge

X. Implementing a Scalable OSPF-Based Solution

- A. Understanding OSPF
 - 1. Link-State Routing Protocol Overview
 - 2. Link-State Routing Protocol Data Structures
 - 3. Introducing OSPF
 - 4. Establishing OSPF Neighbor Adjacencies
 - 5. OSPF Neighbor States
 - 6. SPF Algorithm
 - 7. Building a Link-State Database
 - 8. OSPF Packet Types

Lab: Configure and Verify Single-Area OSPF

- B. Multiarea OSPF IPv4 Implementation
 - 1. OSPF Area Structure
 - 2. Single-Area vs. Multiarea OSPF

Lab: Configure and Verify Multiarea OSPF

- C. Implementing OSPFv3 for IPv6
 - 1. OSPFv3 for IPv6

Lab: Configure and Verify OSPFv3

- D. Troubleshooting Multiarea OSPF
 - 1. Components of Troubleshooting OSPF
 - 2. Troubleshooting OSPF Neighbor Issues
 - 3. Troubleshooting OSPF Routing Table Issues
 - 4. Troubleshooting OSPF Path Selection
 - 5. Troubleshooting OSPFv3 Issues

Lab: Troubleshoot Multiarea OSPF

XI. Implementing Wide-Area Networks

- A. Understanding WAN Technologies
 - 1. Introduction to WAN Technologies
 - 2. WAN Topology Options
 - 3. WAN Connectivity Options
 - 4. Provider-Managed VPNs
 - 5. Enterprise-Managed VPNs
 - 6. WAN Devices

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Course Outline (cont'd)

- B. Understanding Point-to-Point Protocols
 - 1. Serial Point-to-Point Communication Links
 - 2. Point-to-Point Protocol
 - Lab: Configure Serial Interface and PPP**
 - Lab: Configure and Verify MLP**
 - Lab: Configure and Verify PPPoE Client**
- C. Configuring GRE Tunnels
 - 1. GRE Tunnel Overview
 - Lab: Configure and Verify GRE Tunnel**
- D. Configuring Single-Homed EBGP
 - 1. Interdomain Routing
 - 2. Introduction to EBGP
 - Lab: Configure and Verify Single Homed EBGP**
- XII. Network Device Management**
 - A. Implementing Basic Network Device Management
 - 1. Syslog Overview
 - 2. Syslog Message Format
 - 3. Syslog Configuration
 - 4. SNMP Overview
 - Lab: Configure Syslog**
 - Lab: Configure SNMP**
 - B. Evolution of Intelligent Networks
 - 1. Switch Stacking
 - 2. Cloud Computing and Its Effect on Enterprise Network
 - 3. Overview of Network Programmability in Enterprise Network
 - 4. Application Programming Interfaces
 - 5. Cisco APIC-EM
 - 6. Introducing Cisco Intelligent WAN
 - C. Introducing QoS
 - 1. Traffic Characteristics
 - 2. Need for QoS
 - 3. QoS Mechanisms Overview
 - 4. Trust Boundary
 - 5. QoS Mechanisms—Classification and Marking
 - 6. Classification Tools
 - 7. QoS Mechanisms—Policing, Shaping, and Re-Marking
 - 8. Tools for Managing Congestion
 - 9. Tools for Congestion Avoidance
 - D. Managing Cisco Devices
 - 1. V4 Concept
 - 2. Router Internal Components
 - 3. ROM Functions
 - 4. Stages of the Router Power-On Boot Sequence
 - 5. Configuration Register
 - 6. Locating Cisco IOS Image Files
 - 7. Loading Cisco IOS Image Files
 - 8. Loading Cisco IOS Configuration Files
 - 9. Cisco IOS Integrated File System and Devices
 - 10. Managing Cisco IOS Images
 - 11. Deciphering Cisco IOS Image Filenames
 - 12. Managing Device Configuration Files
 - 13. Password Recovery
 - E. Licensing
 - 1. Licensing Overview
 - 2. Licensing Verification
 - 3. Permanent License Installation
 - 4. Evaluation License Installation
 - 5. Backing Up the License
 - 6. Uninstalling the License
 - 7. Cisco Smart Software Manager
- XIII. Summary Challenge**
 - A. Troubleshooting Scalable Multiarea Network
 - Lab: Summary Challenge**
 - B. Lesson 2: Implementing and Troubleshooting Scalable Multiarea Network
 - Lab: Summary Challenge**
- XIV. Labs:**
 - Summary Challenge Lab: 1
 - Summary Challenge Lab: 2
 - Implementing RIPv2
 - Implement IPv6 Static Routing
 - Troubleshooting IPv4 Connectivity
 - Troubleshooting IPv6 Connectivity
 - Securing Device Administrative Access
 - Implementing Device Hardening
 - Troubleshooting EIGRP
 - Summary Challenge Lab: 3
 - Summary Challenge Lab: 4
 - Troubleshooting OSPF
 - Implementing Single-Homed EBGP
 - Summary Challenge Lab: 5
 - Summary Challenge Lab: 6
 - Get Started with Cisco CLI

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Course Outline (cont'd)

- Perform Basic Switch Configuration
- Observe How a Switch Operates
- Troubleshoot Switch Media and Port Issues
- Inspect TCP/IP Applications
- Start with Cisco Router Configuration
- Configure Cisco Discovery Protocol
- Configure Default Gateway
- Exploration of Packet Forwarding
- Configure and Verify Static Routes
- Configure and Verify ACLs
- Configure a Provider-Assigned IP Address
- Configure Static NAT
- Configure Dynamic NAT and PAT
- Troubleshoot NAT
- Configure VLAN and Trunk
- Troubleshoot VLANs and Trunks
- Configure Root Bridge and Analyze STP Topology
- STP Issues
- Configure and Verify EtherChannel
- Configure a Router on a Stick
- Configure a Cisco Router as a DHCP Server
- Troubleshoot DHCP Issues
- Configure and Verify HSRP
- Troubleshoot HSRP
- Configure and Verify RIPv2
- Troubleshoot RIPv2
- Configure Basic IPv6 Connectivity
- Configure IPv6 Static Routes
- Use Troubleshooting Tools
- Configure and Verify IPv4 Extended Access Lists
- Troubleshoot IPv4 Network Connectivity
- Configure and Verify IPv6 Extended Access Lists
- Troubleshoot IPv6 Network Connectivity
- Enhance Security of Initial Configuration
- Limit Remote Access Connectivity
- Configure and Verify Port Security
- Configure and Verify NTP
- Configure External Authentication Using RADIUS and TACACS+
- Configure and Verify EIGRP
- Configure and Verify EIGRP for IPv6
- Troubleshoot EIGRP
- Configure and Verify Single-Area OSPF
- Configure and Verify Multiarea OSPF
- Configure and Verify OSPFv3
- Troubleshoot Multiarea OSPF
- Configure Serial Interface and PPP
- Configure and Verify MLP
- Configure and Verify PPPoE Client
- Configure and Verify GRE Tunnel
- Configure and Verify Single Homed EBGP
- Configure Syslog
- Configure SNMP