Interconnecting Cisco Networking Devices Accelerated 3.0 (CCNAX)

COURSE OVERVIEW:
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.

WHO WILL BENEFIT FROM THIS COURSE?
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.

Target Audience: Entry Level Network Engineer, Network Administrator, Network Support Technician or Help Desk Technician

PREREQUISITES:
The knowledge and skills that a learner is expected to have before attending this course:
- Basic computer literacy
- Basic PC operating system navigation skills
- Basic Internet usage skills
- Basic IP address knowledge
- Good understanding of network fundamentals

RELATED COURSES:
Interconnecting Cisco Networking Devices, Part 1 (ICND1)
Interconnecting Cisco Networking Devices, Part 2 (ICND2)

COURSE OBJECTIVES:
To provide the student with the knowledge and skills required to:
- 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
COURSE OUTLINE:

Module 1: Building a Simple Network

Lesson 1: Exploring the Functions of Networking
- What Is a Computer Network?
- Physical Components of a Network
- Characteristics of a Network
- Physical vs. Logical Topologies
- Interpreting a Network Diagram
- Impact of User Applications on the Network

Lesson 2: Understanding the Host-to-Host Communications Model
- Introducing Host-to-Host Communications
- OSI Reference Model
- TCP/IP Protocol Suite
- Peer-to-Peer Communications
- Encapsulation and De-Encapsulation

Lesson 3: Introducing LANs
- Local Area Networks
- LAN Components
- Need for Switches
- Switches

Lesson 4: Operating Cisco IOS Software
- Cisco IOS Software Features and Functions
- Cisco IOS CLI Functions
- Cisco IOS Software Modes
- Discovery Lab 1: Get Started with Cisco CLI

Lesson 5: Starting a Switch
- Switch Installation
- Switch LED Indicators
- Connecting to a Console Port
- Basic Show Commands and Information
- Discovery Lab 2: Perform Basic Switch Configuration

Lesson 6: Understanding Ethernet and Switch Operation
- Ethernet LAN Connection Media
- Ethernet Frame Structure
- MAC Addresses
- Frame Switching
- Duplex Communication
- Discovery 3: Observe How a Switch Operates
Lesson 7: Troubleshooting Common Switch Media Issues
- Troubleshooting Methods
- Troubleshooting Tools
- Troubleshooting Common Switch Media Issues
- Troubleshooting Common Switch Port Issues
- General Troubleshooting Process
- Discovery Lab 4: Troubleshoot Switch Media and Port Issues

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
- Private vs. Public IP Addresses
- Domain Name System
- Verifying the IPv4 Address of a Host

Lesson 2: Understanding IP Addressing and Subnets
- Subnets
- Subnet Masks
- Implementing Subnetting: Borrowing Bits
- Implementing Subnetting: Determining the Addressing Scheme
- Benefits of VLSM and Implementing VLSM

Lesson 3: Understanding the TCP/IP Transport Layer
- TCP/IP Transport Layer Functions
- Reliable vs. Best-Effort Transport
- TCP vs. UDP Analogy
- TCP Characteristics
- UDP Characteristics
- TCP/IP Applications
- Discovery Lab 5: Inspect TCP/IP Applications

Lesson 4: Exploring the Functions of Routing
- Role of a Router
- Router Components
- Router Function
- Routing Table
- Dynamic Routing Protocol
- Path Determination
Lesson 5: Configuring a Cisco Router
- Initial Router Setup
- Configuring Router Interfaces
- IP Addresses on Router Interfaces
- Checking Interface Configuration and Status
- Exploring Connected Devices
- Using Cisco Discovery Protocol
- Configuring LLDP
- Discovery Lab 6: Start with Cisco Router Configuration
- Discovery Lab 7: Configure Cisco Discovery Protocol

Lesson 6: Exploring the Packet Delivery Process
- Address Resolution Protocol
- Default Gateways
- Host-to-Host Packet Delivery
- Role of a Switch in Packet Delivery
- Troubleshooting Common Problems Associated with IP Addressing
- Discovery Lab 8: Configure Default Gateway
- Discovery Lab 9: Exploration of Packet Forwarding

Lesson 7: Enabling Static Routing
- Routing Operation
- Static and Dynamic Routing Comparison
- When to Use Static Routing
- Static Route Configuration
- Default Routes
- Verifying the Static Route Configuration
- Verifying the Default Route Configuration
- Discovery Lab 10: Configure and Verify Static Routes

Lesson 8: Learning Basics of ACL
- ACL Overview
- ACL Operation
- ACL Wildcard Masking
- Wildcard Bit Mask Abbreviations
- Types of ACLs
- Testing an IP Packet Against a Numbered Standard Access List
- Configuring Standard IPv4 ACLs
- Using ACLs to Filter Network Traffic
- Applying ACLs to Interfaces
- Configuring Named ACLs
- Discovery 11: Configure and Verify ACLs
Lesson 9: Enabling Internet Connectivity
- Demarcation Point
- Provider-Assigned IP Addresses
- Public vs. Private IPv4 Addresses
- Introducing NAT
- Types of Addresses in NAT
- Types of NAT
- Understanding Static NAT
- Configuring and Verifying Static NAT
- Understanding Dynamic NAT
- Configuring and Verifying Dynamic NAT
- Understanding PAT
- Configuring and Verifying PAT
- Troubleshooting NAT
- Discovery Lab 12: Configure a Provider-Assigned IP Address
- Discovery Lab 13: Configure Static NAT
- Discovery Lab 14: Configure Dynamic NAT and PAT
- Discovery Lab 15: Troubleshoot NAT

Module 3: Summary Challenge
Lesson 1: Establish Internet Connectivity
- Challenge Lab: Summary Challenge Lab

Lesson 2: Troubleshoot Internet Connectivity
- Challenge Lab: Summary Challenge

Module 4: Implementing Scalable Medium-Sized Networks
Lesson 1: Implementing and Troubleshooting VLANs and Trunks
- Enterprise Network Design
- Issues in a Poorly Designed Network
- VLAN Introduction
- Creating a VLAN
- Assigning a Port to a VLAN
- Trunking with 802.1Q
- Configuring an 802.1Q Trunk
- Dynamic Trunking Protocol
- VLAN Trunking Protocol
- VLAN Design Consideration
- Discovery Lab 16: Configure VLAN and Trunk
- Discovery Lab 17: Troubleshoot VLANs and Trunks
Lesson 2: Building Redundant Switched Topologies
- V4 Concept
- Physical Redundancy in a LAN
- Issues in Redundant Topologies
- Loop Resolution with STP
- Spanning-Tree Operation
- Spanning-Tree Operation Example
- Types of Spanning-Tree Protocols
- Comparison of Spanning-Tree Protocols
- Per VLAN Spanning Tree Plus
- PVST+ Extended Bridge ID
- PortFast and BPDUs Guardian
- Configuring PortFast and BPDUs Guardian
- Discovery Lab 18: Configure Root Bridge and Analyze STP Topology
- Discovery Lab 19: Troubleshoot STP Issues

Lesson 3: Improving Redundant Switched Topologies with EtherChannel
- EtherChannel Overview
- EtherChannel Protocols
- Discovery Lab 20: Configure and Verify EtherChannel

Lesson 4: Routing Between VLANs
- Purpose of Inter-VLAN Routing
- Options for Inter-VLAN Routing
- Discovery Lab 21: Configure a Router on a Stick

Lesson 5: Using a Cisco IOS Network Device as a DHCP Server
- Need for a DHCP Server
- Understanding DHCP
- Configuring a DHCP Server
- Understanding DNS
- Discovery Lab 22: Configure a Cisco Router as a DHCP Server
- Discovery Lab 23: Troubleshoot DHCP Issues

Lesson 6: Understanding Layer 3 Redundancy
- Need for Default Gateway Redundancy
- Understanding FHRP
- Understanding HSRP
- Discovery Lab 24: Configure and Verify HSRP
- Discovery Lab 25: Troubleshoot HSRP

Lesson 7: Implementing RIPv2
- Overview of Routing Protocols
- Distance Vector and Link-State Routing Protocols
- Understanding RIPv2
- Configure RIPv2
- Verify RIPv2
- Discovery Lab 26: Configure and Verify RIPv2
- Discovery Lab 27: Troubleshoot RIPv2
Module 5: Introducing IPv6

Lesson 1: Introducing Basic IPv6
- IPv4 Addressing Exhaustion Workarounds
- IPv6 Features
- IPv6 Addresses
- IPv6 Address Scopes and Prefixes
- IPv6 Address Allocation

Lesson 2: Understanding IPv6 Operation
- Comparison of IPv4 and IPv6 Headers
- Internet Control Message Protocol Version 6
- Neighbor Discovery
- Stateless Address Autoconfiguration
- Discovery Lab 28: Configure Basic IPv6 Connectivity

Lesson 3: Configuring IPv6 Static Routes
- Routing for IPv6
- Configuring IPv6 Static Routes
- Discovery Lab 29: Configure IPv6 Static Routes

Module 6: Troubleshooting Basic Connectivity

Lesson 1: Troubleshooting IPv4 Network Connectivity
- Troubleshooting Guidelines
- Troubleshooting Physical Connectivity Issue
- Identification of Current and Desired Path
- Using SPAN for Troubleshooting
- Troubleshooting Default Gateway Issues
- Troubleshooting Name Resolution Issue
- Troubleshooting ACL Issues
- Discovery Lab 30: Use Troubleshooting Tools
- Discovery Lab 31: Configure and Verify IPv4 Extended Access Lists
- Discovery Lab 32: Troubleshoot IPv4 Network Connectivity

Lesson 2: Troubleshooting IPv6 Network Connectivity
- IPv6 Unicast Addresses
- Troubleshooting End-to-End IPv6 Connectivity
- Verification of End-to-End IPv6 Connectivity
- Identification of Current and Desired IPv6 Path
- Troubleshooting Default Gateway Issues in IPv6
- Troubleshooting Name Resolution Issues in IPv6
- Troubleshooting ACL Issues in IPv6
- Discovery Lab 33: Configure and Verify IPv6 Extended Access Lists
- Discovery Lab 34: Troubleshoot IPv6 Network Connectivity
Module 7: Implementing Network Device Security

Lesson 1: Securing Administrative Access
- Network Device Security Overview
- Securing Access to Privileged EXEC Mode
- Securing Console Access
- Securing Remote Access
- Limiting Remote Access with ACLs
- Configuring the Login Banner
- Discovery Lab 35: Enhance Security of Initial Configuration
- Discovery Lab 36: Limit Remote Access Connectivity

Lesson 2: Implementing Device Hardening
- Securing Unused Ports
- Port Security
- Configuring Port Security
- Verifying Port Security
- Disabling Unused Services
- Network Time Protocol
- Configuring NTP
- Verifying NTP
- Discovery 37: Configure and Verify Port Security
- Discovery 38: Configure and Verify NTP

Lesson 3: Implementing Advance Security
- Mitigating Threats at Access Layer
- External Authentication Options
- Discovery Lab 39: Configure External Authentication Using RADIUS and TACACS+

Module 8: Implementing an EIGRP-Based Solution

Lesson 1: Implementing EIGRP
- Dynamic Routing Protocols
- Administrative Distance
- EIGRP Features
- EIGRP Path Selection
- EIGRP Metric
- EIGRP Load Balancing
- Discovery 40: Configure and Verify EIGRP

Lesson 2: Implementing EIGRP for IPv6
- EIGRP for IPv6
- Discovery Lab 41: Configure and Verify EIGRP for IPv6
Lesson 3: Troubleshooting EIGRP
• Troubleshooting EIGRP Issues
• Troubleshooting EIGRP Neighbor Issues
• Troubleshooting EIGRP Routing Table Issues
• Troubleshooting EIGRP for IPv6 Issues
• Discovery Lab 42: Troubleshoot EIGRP

Module 9: Summary Challenge

Lesson 1: Troubleshooting a Medium-Sized Network
• Challenge Lab: Summary Challenge

Lesson 2: Troubleshooting Scalable Medium-Sized Network
• Challenge Lab: Summary Challenge

Module 10: Implementing a Scalable OSPF-Based Solution

Lesson 1: Understanding OSPF
• Link-State Routing Protocol Overview
• Link-State Routing Protocol Data Structures
• Introducing OSPF
• Establishing OSPF Neighbor Adjacencies
• OSPF Neighbor States
• SPF Algorithm
• Building a Link-State Database
• OSPF Packet Types
• Discovery Lab 43: Configure and Verify Single-Area OSPF

Lesson 2: Multiarea OSPF IPv4 Implementation
• OSPF Area Structure
• Single-Area vs. Multiarea OSPF
• Discovery Lab 44: Configure and Verify Multiarea OSPF

Lesson 3: Implementing OSPFv3 for IPv6
• OSPFv3 for IPv6
• Discovery 45: Configure and Verify OSPFv3

Lesson 4: Troubleshooting Multiarea OSPF
• Components of Troubleshooting OSPF
• Troubleshooting OSPF Neighbor Issues
• Troubleshooting OSPF Routing Table Issues
• Troubleshooting OSPF Path Selection
• Troubleshooting OSPFv3 Issues
• Discovery 46: Troubleshoot Multiarea OSPF
Module 11: Implementing Wide-Area Networks

Lesson 1: Understanding WAN Technologies
- Introduction to WAN Technologies
- WAN Topology Options
- WAN Connectivity Options
- Provider-Managed VPNs
- Enterprise-Managed VPNs
- WAN Devices

Lesson 2: Understanding Point-to-Point Protocols
- Serial Point-to-Point Communication Links
- Point-to-Point Protocol
- Discovery Lab 47: Configure Serial Interface and PPP
- Discovery Lab 48: Configure and Verify MLP
- Discovery Lab 49: Configure and Verify PPoE Client

Lesson 3: Configuring GRE Tunnels
- GRE Tunnel Overview
- Discovery Lab 50: Configure and Verify GRE Tunnel

Lesson 4: Configuring Single-Homed EBGP
- Interdomain Routing
- Introduction to EBGP
- Discovery Lab 51: Configure and Verify Single Homed EBGP

Module 12: Network Device Management

Lesson 1: Implementing Basic Network Device Management
- Syslog Overview
- Syslog Message Format
- Syslog Configuration
- SNMP Overview
- Discovery Lab 52: Configure Syslog
- Discovery Lab 53: Configure SNMP

Lesson 2: Evolution of Intelligent Networks
- Switch Stacking
- Cloud Computing and Its Effect on Enterprise Network
- Overview of Network Programmability in Enterprise Network
- Application Programming Interfaces
- Cisco APIC-EM
- Introducing Cisco Intelligent WAN
Lesson 3: Introducing QoS
- Traffic Characteristics
- Need for QoS
- QoS Mechanisms Overview
- Trust Boundary
- QoS Mechanisms—Classification and Marking
- Classification Tools
- QoS Mechanisms—Policing, Shaping, and Re-Marking
- Tools for Managing Congestion
- Tools for Congestion Avoidance

Lesson 4: Managing Cisco Devices
- V4 Concept
- Router Internal Components
- ROM Functions
- Stages of the Router Power-On Boot Sequence
- Configuration Register
- Locating Cisco IOS Image Files
- Loading Cisco IOS Image Files
- Loading Cisco IOS Configuration Files
- Cisco IOS Integrated File System and Devices
- Managing Cisco IOS Images
- Deciphering Cisco IOS Image Filenames
- Managing Device Configuration Files
- Password Recovery

Lesson 5: Licensing
- Licensing Overview
- Licensing Verification
- Permanent License Installation
- Evaluation License Installation
- Backing Up the License
- Uninstalling the License
- Cisco Smart Software Manager

Module 13: Summary Challenge

Lesson 1: Troubleshooting Scalable Multiarea Network
- Challenge Lab: Summary Challenge

Lesson 2: Implementing and Troubleshooting Scalable Multiarea Network
- Challenge Lab: Summary Challenge
Labs:

- Challenge 1: Summary Challenge Lab: 1
- Challenge 2: Summary Challenge Lab: 2
- Challenge 3: Implementing RIPv2
- Challenge 4: Implement IPv6 Static Routing
- Challenge 5: Troubleshooting IPv4 Connectivity
- Challenge 6: Troubleshooting IPv6 Connectivity
- Challenge 7: Securing Device Administrative Access
- Challenge 8: Implementing Device Hardening
- Challenge 9: Troubleshooting EIGRP
- Challenge 10: Summary Challenge Lab: 3
- Challenge 11: Summary Challenge Lab: 4
- Challenge 12: Troubleshooting OSPF
- Challenge 13: Implementing Single-Homed EBGP
- Challenge 14: Summary Challenge Lab: 5
- Challenge 15: Summary Challenge Lab: 6

- Discovery 1: Get Started with Cisco CLI
- Discovery 2: Perform Basic Switch Configuration
- Discovery 3: Observe How a Switch Operates
- Discovery 4: Troubleshoot Switch Media and Port Issues
- Discovery 5: Inspect TCP/IP Applications
- Discovery 6: Start with Cisco Router Configuration
- Discovery 7: Configure Cisco Discovery Protocol
- Discovery 8: Configure Default Gateway
- Discovery 9: Exploration of Packet Forwarding
- Discovery 10: Configure and Verify Static Routes
- Discovery 11: Configure and Verify ACLs
- Discovery 12: Configure a Provider-Assigned IP Address
- Discovery 13: Configure Static NAT
- Discovery 14: Configure Dynamic NAT and PAT
- Discovery 15: Troubleshoot NAT
- Discovery 16: Configure VLAN and Trunk
- Discovery 17: Troubleshoot VLANs and Trunks
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- Discovery 20: Configure and Verify EtherChannel
- Discovery 21: Configure a Router on a Stick
- Discovery 22: Configure a Cisco Router as a DHCP Server
- Discovery 23: Troubleshoot DHCP Issues
- Discovery 24: Configure and Verify HSRP
- Discovery 25: Troubleshoot HSRP
- Discovery 26: Configure and Verify RIPv2
- Discovery 27: Troubleshoot RIPv2
- Discovery 28: Configure Basic IPv6 Connectivity
- Discovery 29: Configure IPv6 Static Routes
- Discovery 30: Use Troubleshooting Tools
- Discovery 31: Configure and Verify IPv4 Extended Access Lists
- Discovery 32: Troubleshoot IPv4 Network Connectivity
- Discovery 33: Configure and Verify IPv6 Extended Access Lists
- Discovery 34: Troubleshoot IPv6 Network Connectivity
- Discovery 35: Enhance Security of Initial Configuration
- Discovery 36: Limit Remote Access Connectivity
- Discovery 37: Configure and Verify Port Security
- Discovery 38: Configure and Verify NTP
- Discovery 39: Configure External Authentication Using RADIUS and TACACS+
- Discovery 40: Configure and Verify EIGRP
- Discovery 41: Configure and Verify EIGRP for IPv6
- Discovery 42: Troubleshoot EIGRP
- Discovery 43: Configure and Verify Single-Area OSPF
- Discovery 44: Configure and Verify Multiarea OSPF
- Discovery 45: Configure and Verify OSPFv3
- Discovery 46: Troubleshoot Multiarea OSPF
- Discovery 47: Configure Serial Interface and PPP
- Discovery 48: Configure and Verify MLP
- Discovery 49: Configure and Verify PPPoE Client
- Discovery 50: Configure and Verify GRE Tunnel
- Discovery 51: Configure and Verify Single Homed EBGP
- Discovery 52: Configure Syslog
- Discovery 53: Configure SNMP
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