Interconnecting Cisco Networking Devices Accelerated v1.1 CCNAX

Course Summary

Description

Interconnecting Cisco Networking Devices: Accelerated (CCNAX) v1.1 is course that provides students with the knowledge and skills necessary to install, operate, and troubleshoot a small to medium-sized network, including connecting to a WAN and implementing network security. This course is the equivalent of Interconnecting Cisco Network Devices Part 1 v1.1 and Interconnecting Cisco Network Devices Part 2 v1.1 together.

Objectives

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

- Describe how networks function, identifying major components, function of network components, and the OSI reference model
- Describe issues related to increasing traffic on an Ethernet LAN and expand the switched network from a small LAN to a medium-sized LAN with multiple switches supporting VLANs, trunking, and spanning tree
- Describe the reasons for extending the reach of a LAN and the methods that can be used, with a focus on RF wireless access
- Describe the reasons for connecting networks and connecting multiple IP subnets with routers
- Configure and verify a Cisco router for WAN connections with HDLC and PPP encapsulation, PAT, static routing, and describe the components that make up a VPN solution
- Use the command-line interface to discover neighbors on the network and manage the router startup and configuration
- Describe routing concepts as they apply to a medium-sized network, discuss dynamic routing with distance vector and link-state routing protocols, and configure RIP
- Configure, verify, and troubleshoot single-area OSPF
- Configure, verify, and troubleshoot EIGRP
- Determine how to apply ACLs based on network requirements, and to configure, verify, and troubleshoot ACLs
- Describe when to use NAT and PAT on a medium-sized network, how to configure NAT and PAT, and explain IPv6 addressing and configuration on a Cisco router
- Configure, verify, and troubleshoot Frame Relay

Topics

- Building a Simple Network
- Switching
- Wireless LANs
- LAN Connections
- WAN Connections
- Network Environment Management
- Medium-Sized Routed Network Construction
- Single-Area OSPF Implementation
- EIGRP Implementation
- Access Control Lists
- Address Space Management
- LAN Extension into a WAN with Frame Relay

Audience

This course is designed for network administrators, network engineers, network managers, and systems engineers. This course may also be of benefit to network designers and project managers.

Prerequisites

Before taking this course, students should have basic computer literacy, basic Microsoft windows navigation skills and basic internet usage skills.

Duration

Five days

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Course Outline

I. Building a Simple Network

A. Exploring the Functions of Networking
1. What Is a Network?
2. Common Physical Components of a Network
3. Interpreting a Network Diagram
4. Resource-Sharing Functions and Benefits
5. Network User Applications
6. Impact of User Applications on the Network
7. Characteristics of a Network
8. Physical vs. Logical Topologies
9. Bus Topology
10. Star and Extended-Star Topologies
11. Ring Topologies
12. Mesh and Partial-Mesh Topologies
13. Connection to the Internet

B. Securing the Network
1. Need for Network Security
2. Balancing Network Security Requirements
3. Adversaries, Adversary Motivations, and Classes of Attack
4. Mitigating Common Threats

C. Understanding the Host-to-Host Communications Model
1. Understanding Host-to-Host Communications
2. OSI Reference Model
3. OSI Model Layers and Their Functions
4. Encapsulation and De-Encapsulation
5. Peer-to-Peer Communication
6. TCP/IP Suite

D. Understanding the TCP/IP Internet Layer
1. Internet Protocol
2. IP Address Fields
3. IP Addressing
4. IP Address Classes
5. Reserved IP Addresses
6. Public and Private IP Addresses
7. DHCP
8. Domain Name System
9. Using Common Host Tools to Determine the IP Address of a Host

E. Understanding the TCP/IP Transport Layer
1. Transport Layer Functions
2. Reliable vs. Best Effort
3. User Datagram Protocol
4. Transmission Control Protocol
5. TCP Header
6. TCP/IP Applications
7. Passing Transport to Applications
8. Establishing a Connection with a Peer System
9. Three-Way Handshake
10. Flow Control
11. TCP Acknowledgment
12. Windowing
13. TCP Sliding Windowing
14. TCP Sequence Number and Acknowledgment Numbers

F. Exploring the Packet Delivery Process
1. Layer 1 Devices and Their Function
2. Layer 2 Devices and Their Function
3. Layer 2 Addressing
4. Layer 3 Devices and Their Function
5. Layer 3 Addressing
6. Mapping Layer 2 Addressing to Layer 3 Addressing
7. ARP Table
8. Host-to-Host Packet Delivery
9. Function of the Default Gateway
10. Using Common Host Tools to Determine the Path Between Two Hosts Across a Network

G. Understanding Ethernet
1. Definition of a LAN
2. Components of a LAN
3. Functions of a LAN
4. How Large Is a LAN?
5. Ethernet
6. Ethernet LAN Standards
7. Ethernet Frames
8. Ethernet Frame Addressing
9. Ethernet Addresses
10. MAC Addresses and Binary-Hexadecimal Numbers

H. Connecting to an Ethernet LAN
1. Ethernet NICs
2. Ethernet Media and Connection Requirements
3. Connection Media
4. UTP Implementation

II. Switching

A. Understanding the Challenges of Shared LANs
1. Ethernet LAN Segments
2. Extending a LAN Segment
3. Collisions
4. Collision Domains
5. Role of CSMA/CD in Ethernet

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Course Outline (cont'd)

B. Solving Network Challenges with Switched LAN Technology
   1. Typical Causes of Network Congestion
   2. Bridges: Early Solutions to Network Congestion
   3. How Switches Segment the Ethernet Network
   4. Switches
   5. Switches vs. Bridges
   6. Switching in Action
   7. LANs Using Switched Technology
C. Exploring the Packet Delivery Process
   1. Layer 2 Addressing
   2. Layer 3 Addressing
   3. Host-to-Host Packet Delivery
D. Operating Cisco IOS Software
   1. Cisco IOS Software Features and Functions
   2. Configuring Network Devices
   3. External Configuration Sources
   4. Cisco IOS CLI Functions
   5. Entering the EXEC Modes
   6. Keyboard Help in the CLI
   7. Enhanced Editing Commands
   8. Command History
E. Starting a Switch
   1. Physical Startup of the Catalyst Switch
   2. Switch LED Indicators
   3. Viewing Initial Bootup Output from the Switch
   4. Logging Into the Switch
   5. Configuring a Switch from the Command Line
   6. Showing the Switch Initial Startup Status
   7. MAC Address Table Management
F. Securing the Switch
   1. Overview of Switch Security Concerns
   2. Physical and Environmental Threats
   3. Securing Switch Devices
   4. Configuring Password Security
   5. Telnet vs. SSH Access
   6. Configuring the Login Banner
   7. Port Security
   8. Port Security Configuration
   9. Securing Switch Protocols
G. Maximizing the Benefits of Switching
   1. Microsegmentation
   2. Duplex Communication
   3. The need for Different Media Rates in an Enterprise Network
   4. Physical Redundancy in an Ethernet LAN
   5. Loop Resolution with Spanning Tree Protocol
   6. VoIP Requirements in Switched Networks
H. Implementing VLANs and Trunks
   1. Understanding VLANs
   2. Understanding Trunking with 802.1Q
   3. Understanding VLAN Trunking Protocol
   4. Configuring VLANs and Trunks
   5. Lesson 9: Optimizing Spanning Tree Performance
   6. Building a Redundant Switched Topology
   7. Recognizing Issues of a Redundant Switched Topology
   8. Resolving Issues with STP
   9. STP Operation
   10. Configuring RSTP
I. Routing Between VLANs
   1. Understanding Inter-VLAN Routing
   2. Configuring Inter-VLAN Routing
J. Troubleshooting Switched Networks
   1. Troubleshooting Switches
   2. Using a Layered Approach
   3. Troubleshooting Port Connectivity
   4. Identifying and Resolving Common Access Port Issues
   5. Troubleshooting VLANs and Trunking
   6. Troubleshooting VTP
   7. Troubleshooting Spanning Tree

III. Wireless LANs

A. Exploring Wireless Networking
   1. Business Case for WLAN Service
   2. Differences Between WLANs and LANs
   3. RF Transmission
   4. Organizations that Define WLANs
   5. ITU-R Local FCC Wireless
   6. 802.11 Standards Comparison
   7. Wi-Fi Certification
B. Understanding WLAN Security
   1. WLAN Security Threats
   2. Mitigating Security Threats
   3. Evolution of WLAN Security
   4. Wireless Client Association
   5. How 802.1X Works on WLANs
   6. WPA and WPA2 Modes

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Course Outline (cont'd)

C. Implementing a WLAN
   1. 802.11 Topology Building Blocks
   2. BSA Wireless Topology
   3. Wireless Topology Data Rates
   4. Access Point Configuration
   5. Steps to Implement a Wireless Network
   6. Wireless Clients
   7. Wireless Troubleshooting

IV. LAN Connections

A. Understanding Binary Basics
   1. Decimal and Binary Systems
   2. Powers of 2
   3. Decimal-to-Binary Conversion
   4. Binary-to-Decimal Conversion

B. Constructing a Network Addressing Scheme
   1. Subnetworks
   2. How End Systems Use Subnet Masks
   3. How Routers Use Subnet Masks
   4. Mechanics of Subnet Mask Operation
   5. Computing Usable Subnetworks and Hosts
   6. Applying Subnet Mask Operation

C. Exploring the Packet Delivery Process
   1. Layer 2 Addressing
   2. Layer 3 Addressing
   3. Host-to-Host Packet Delivery
   4. Using the show ip arp Command
   5. Using Common Cisco IOS Tools

D. Starting a Cisco Router
   1. Initial Startup of a Cisco Router
   2. Initial Setup of a Cisco Router
   3. Logging In to the Cisco Router
   4. Showing the Router Initial Startup Status

E. Configuring a Cisco Router
   1. Cisco Router Configuration Modes
   2. Configuring a Cisco Router from the CLI
   3. Configuring Cisco Router Interfaces
   4. Configuring the Cisco Router IP Address
   5. Verifying the Interface Configuration

F. Understanding Cisco Router Security
   1. Physical and Environmental Threats
   2. Configuring Password Security
   3. Configuring the Login Banner
   4. Telnet and SSH Access

G. Using Cisco SDM
   1. Cisco SDM Overview
   2. Cisco SDM User Interface
   3. Cisco SDM Wizards

H. Using a Cisco Router as a DHCP Server
   1. Understanding DHCP
   2. Using a Cisco Router as a DHCP Server
   3. Using Cisco SDM to Enable the DHCP Server Function
   4. Monitoring DHCP Server Functions

V. WAN Connections

A. Understanding WAN Technologies
   1. What Is a WAN?
   2. Why Are WANs Necessary?
   3. How Is a WAN Different from a LAN?
   4. WAN Access and the OSI Reference Model
   5. WAN Devices
   6. WAN Cabling
   7. The Role of Routers in WANs
   8. WAN Data-Link Protocols
   9. WAN Communication Link Options

B. Enabling the Internet Connection
   1. Packet-Switched Communications Links
   2. Digital Subscriber Line
   3. Cable
   4. Global Internet: The Largest WAN
   5. Obtaining an Interface Address from a DHCP Server
   6. Introducing NAT and PAT
   7. Configuring the DHCP Client and PAT
   8. Verifying the DHCP Client Configuration
   9. Verifying the NAT and PAT Configuration

C. Introducing VPN Solutions
   1. VPNs and Their Benefits
   2. Types of VPNs
   3. Components of VPNs

D. Configuring Serial Encapsulation
   1. Introducing IPsec
   2. IPsec Protocol Framework
   3. Circuit-Switched Communication Links
   4. Public Switched Telephone Network
   5. Point-to-Point Communication Links
   6. High-Level Data Link Control Protocol
   7. Verifying Serial HDLC Encapsulation
   8. Point-to-Point Protocol
   9. Configuring and Verifying PPP

E. Enabling Static Routing
   1. Static and Dynamic Routing Comparison
   2. Static Route Configuration
   3. Default Route Forwarding Configuration
   4. Static Route Configuration Verification

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Course Outline (cont'd)

VI. Network Environment Management
- A. Accessing Remote Devices
  1. Establishing a Telnet or SSH Connection
  2. Suspending and Resuming a Telnet Session
  3. Closing a Telnet Session
  4. Alternate Connectivity Tests
- B. Using CDP
  1. Creating a Network Map of the Environment
  2. Cisco Discovery Protocol
  3. Information Obtained with Cisco Discovery Protocol
  4. Implementation of Cisco Discovery Protocol
  5. Using the show cdp neighbors Command
  6. Monitoring and Maintaining Cisco Discovery Protocol
- C. Managing Cisco Router Startup and Configuration
  1. Internal Router Components
  2. Stages of the Router Power-On Boot Sequence
  3. How a Device Locates and Loads Cisco IOS Image and Configuration Files
  4. Configuration Register
- D. Managing Cisco Devices
  1. Cisco IOS File System and Devices
  2. Managing Cisco IOS Images
  3. Cisco IOS copy Command
  4. Managing Device Configuration Files
  5. Using show and debug Commands on Cisco Devices

VII. Medium-Sized Routed Network Construction
- A. Exploring the Functions of Routing
  1. Routers
  2. Path Determination
  3. Routing Overview
  4. Dynamic Routing Protocol Overview
  5. Routing Tables
  6. Routing Methods
- B. Enabling RIP
  1. Understanding Distance Vector Routing Protocols
  2. RIP Features
  3. RIPv1 and RIPv2 Comparison
  4. Dynamic Routing Configuration Tasks
  5. RIP Configuration
  6. RIP Configuration Verification
  7. RIP Configuration Troubleshooting
- C. Implementing VLSM
  1. Reviewing Subnets
  2. Introducing VLSMs
  3. Understanding Route Summarization

VIII. Single-Area OSPF Implementation
- A. Implementing OSPF
  1. Introducing OSPF
  2. Establishing OSPF Neighbor Adjacencies
  3. SPF Algorithm
  4. Configuring and Verifying OSPF
  5. Loopback Interfaces
  6. Verifying the OSPF Configuration
  7. Using OSPF debug Commands
  8. Load Balancing with OSPF
  9. OSPF Authentication
- B. Troubleshooting OSPF
  1. Components of Troubleshooting OSPF
  2. Troubleshooting OSPF Neighbor Adjacencies
  3. Troubleshooting OSPF Routing Tables
  4. Troubleshooting Plaintext Password Authentication

IX. EIGRP Implementation
- A. Implementing EIGRP
  1. Introducing EIGRP
  2. Configuring and Verifying EIGRP
  3. Load Balancing with EIGRP
  4. EIGRP Authentication
  5. Troubleshooting EIGRP Authentication
- B. Troubleshooting EIGRP
  1. Components of Troubleshooting EIGRP
  2. Troubleshooting EIGRP Neighbor Issues
  3. Troubleshooting EIGRP Routing Tables
  4. Troubleshooting EIGRP Authentication

X. Access Control Lists
- A. Introducing ACL Operation
  1. Understanding ACLs
  2. ACL Operation
  3. Types of ACLs
  4. Additional Types of ACLs
  5. ACL Wildcard Masking
- B. Configuring and Troubleshooting ACLs
  1. Configuring Numbered Standard IPv4 ACLs
  2. Configuring Numbered Extended IPv4 ACLs
  3. Configuring Named ACLs
  4. Troubleshooting ACLs

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Course Outline (cont'd)

XI. Address Space Management

A. Scaling the Network with NAT and PAT
   1. Introducing NAT and PAT
   2. Translating Inside Source Addresses
   3. Overloading an Inside Global Address
   4. Resolving Translation Table Issues
   5. Resolving Issues Using the Correct Translation Entry

B. Transitioning to IPv6
   1. Reasons for Using IPv6
   2. Understanding IPv6 Addresses
   3. Assigning IPv6 Addresses
   4. Configuring IPv6
   5. Routing
   6. Considerations with IPv6
   7. DNS Considerations with IPv6
   8. Strategies for Implementing Ipv6

XII. LAN Extension into a WAN with Frame Relay

A. Establishing a WAN Connection with Frame Relay
   1. Understanding Frame Relay
   2. Configuring Frame Relay
   3. Verifying Frame Relay

B. Troubleshooting Frame Relay WANs
   1. Components of Troubleshooting Frame Relay
   2. Troubleshooting Frame Relay Connectivity Issues

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