Interconnecting Cisco Networking Devices Part 1 ICND1 v1.1

Course Summary

Description

Upon completing this course, the student should have the knowledge and skills that are necessary to install, operate, and troubleshoot a small branch office enterprise network, including configuring a switch and a router, connecting to a WAN, and implementing network security. The student should be able to complete the configuration and implementation of a small branch office network under supervision.

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 Open System Interconnection (OSI) reference model.
- Using the host-to-host packet delivery process, describe issues related to increasing traffic on an Ethernet LAN and identify switched LAN technology solutions to Ethernet networking issues.
- Describes the reasons for extending the reach of a LAN and the methods that can be used with a focus on RF wireless access.
- Describes the reasons for connecting networks with routers and how routed networks transmit data through networks using TCP / IP.
- Describe the function of Wide Area Networks (WANs), the major devices of WANs, and configure PPP encapsulation, static and dynamic routing, PAT and RIP routing.
- Use the CLI to discover neighbors on the network and managing the routers' startup and configuration.

Topics

- Building a Simple Network
- Ethernet LANs
- Wireless LANs
- LAN Connections
- WAN Connections
- Network Environment Management

Audience

The primary audience for this course is as follows:

- Network administrators, Network engineers, Network managers, and Systems engineers

Prerequisites

- Basic computer literacy
- Basic Microsoft Windows navigation skills
- Basic Internet usage skills
- Basic email usage skills

Duration

Five days

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Course Outline

I. Building a Simple Network

A. Network Basics (Example)
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. Logical vs. Physical 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 Addressing
3. IP Address Fields
4. IP Address Classes
5. Reserved IP Addresses
6. Public and Private IP Addresses
7. Dynamic Host Configuration Protocol
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 Network to Transport
8. Passing Transport to Applications
9. Establishing a Connection with a Peer System
10. Three-Way Handshake
11. Flow Control
12. TCP Acknowledgment
13. Windowing
14. TCP Sliding Windowing
15. 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 Physical Addressing to Network 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

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Course Outline (cont'd)

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

II. Ethernet LANs

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

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 Command-Line Interface 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 in to the Switch
   5. Configuring a Switch from the Command Line
   6. Showing the Switch Initial Startup Status
   7. MAC Address Table Management

F. Understanding Switch Security
   1. Physical and Environmental Threats
   2. Configuring Password Security
   3. Configuring the MOTD Banner
   4. Telnet vs. SSH Access
   5. Port Security Configuration
   6. Securing Unused Ports

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

H. Troubleshooting Switch Issues
   1. Using a Layered Approach
   2. Identifying and Resolving Common Access Port Issues
   3. Identifying and Resolving Media Issues
   4. Identifying and Resolving Common Configuration Issues

III. Wireless LANs

A. Exploring Wireless Networking
   1. Business Case for WLAN Services
   2. Differences Between WLANs and LANs
   3. RF Transmission
   4. Organizations That Define WLANs
   5. ITU-R Local FCC Wireless
   6. IEEE 802.11 Standards Comparison
   7. Wi-Fi Certification

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Course Outline (cont'd)

B. Understanding WLAN Security
   1. Wireless LAN 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
C. Implementing a WLAN
   1. IEEE 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
D. VoIP Requirements
   1. VoIP Requirements in Switched Networks

IV. LAN Connections

A. Exploring the Functions of Routing
   1. Routers
   2. Path Determination
   3. Routing Tables
   4. Static, Dynamic, Directly Connected, and Default Routes
   5. Dynamic Routing Protocols
B. Understanding Binary Basics
   1. Decimal and Binary Systems
   2. Powers of 2
   3. Decimal-to-Binary Conversion
   4. Binary-to-Decimal Conversion
C. 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
D. Starting a Cisco Router
   1. Initial Startup of a Cisco Router
   2. Initial Setup of a Cisco Router
   3. Logging into 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. 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
G. Understanding Cisco Router Security
   1. Physical and Environmental Threats
   2. Configuring Password Security
   3. Configuring the Login Banner
   4. Telnet and SSH Access
H. Using Cisco SDM
   1. Cisco SDM Overview
   2. Cisco SDM User Interface
   3. Cisco SDM Wizards
I. 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
J. 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

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Course Outline (cont'd)

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 Communication 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. Translating Inside Source Addresses
8. Configuring the DHCP Client and PAT
9. Verifying the DHCP Client Configuration
10. Verifying the NAT and PAT Configuration

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

D. Configuring Serial Encapsulation
1. Circuit-Switched Communication Links

VI. Public Switched Telephone Network
1. Point-to-Point Communication Links
2. High-Level Data Link Control Protocol
3. Verifying Serial HDLC Encapsulation
4. Point-to-Point Protocol
5. Serial PPP Encapsulation Configuration Verification

B. : Enabling RIP
1. Dynamic Routing Protocol Overview
2. Classless vs. Classful Routing
3. Distance Vector Route Selection
4. RIP Features
5. RIPv1 and RIPv2 Comparison
6. Dynamic Routing Configuration Tasks
7. RIP Configuration
8. RIP Configuration Verification
9. RIP Configuration Troubleshooting

VII. Network Environment Management

A. Discovering Neighbors on the Network
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

B. Managing Cisco Router Startup and Configuration
1. Internal Router Components
2. Stages of the Router Power-On Boot Sequence
3. How a Cisco Device Locates and Loads Cisco IOS Image and Configuration Files
4. Configuration Register

C. 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
6. Commands on Cisco Devices

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