640-822: Interconnecting Cisco Networking Devices Part 1 v1.1

Course Introduction — 3m

Course Introduction

Chapter 01 - Building a Simple Network — 1h 10m

Exploring the Functions of Networking

What Is a Network?
Common Physical Components of a Network
Interpreting a Network Diagram
Resource-Sharing Functions and Benefits
Network User Applications
Impact of User Applications on the Network
Characteristics of a Network
Logical Topologies
Physical Topology
Bus Topology
Star Topology
Extended-Star Topology
Ring Topology
Dual-Ring Topology
Full-Mesh Topology
Partial-Mesh Topology
Connection to the Internet
Demo - Network Topology
Summary

Securing the Network

Need for Network Security
Closed/Open Networks
Threat Capabilities: More Dangerous and Easier to Use
E-Business Challenge
Adversaries, Adversary Motivations, and Classes of Attack
Common Threats
Password Attack Threat Mitigation
Summary

Understanding the Host-to-Host Communications Model

Understanding Host-to-Host Communications
Why a Layered Network Model?
The Seven Layers of the OSI Model
Data Encapsulation/De-Encapsulation
Peer-to-Peer Communication
Demo - OSI Model
TCP/IP Stack
TCP/IP Stack vs. the OSI Model
Summary

Understanding the TCP/IP Internet Layer

Internet Protocol Characteristics
Why IP Addresses?
IP PDU Header
IP Address Format: Dotted Decimal Notation
IP Address Classes: The First Octet
IP Address Ranges
Reserved Address

Public IP Addresses
Private IP Addresses
Demo - IP Address Basics
Dynamic Host Configuration Protocol
Domain Name System
Network Connection
ipconfig
Summary
Understanding the TCP/IP Transport Layer
Transport Layer
Reliable vs. Best-Effort Comparison
UDP Characteristics
UDP Header
TCP Characteristics
TCP Header
TCP/IP Application Layer Overview
Passing Network to Transport Layer
Passing Transport to Applications Layer
Establishing a Connection
Three-Way Handshake
Flow Control
TCP Acknowledgment
Fixed Windowing
TCP Sliding Windowing
TCP Sequence and Acknowledgment Numbers
Demo - TCP
Summary
Exploring the Packet Delivery Process
Layer 1 Devices
Layer 2 Devices
Layer 2 Addressing
Layer 3 Devices and Their Function
Layer 3 Addressing
Address Resolution Protocol
ARP Table
Host-to-Host Packet Delivery
Default Gateway
Demo - Protocols
Host-Based Tools: ping
Host-Based Tools: ARP Table
Host-Based Tools: tracert
Summary
Understanding Ethernet
Local Area Network
LAN Components
Functions of a LAN
LAN Sizes
Ethernet Evolution
LAN Standards
Ethernet Frame Structure
Communicating Within the LAN
MAC Address Components
MAC Addresses
Summary
Connecting to an Ethernet LAN
Network Interface Card
Comparing Ethernet Media Requirements

Differentiating Between Connections
1000BASE-T GBIC
Cisco Fiber-Optic GBICs
Cisco Fiber-Optic SFPs
Unshielded Twisted-Pair Cable
Optical Fiber Media
RJ-45 Connector
RJ-45 Jack
UTP Implementation (Straight-Through/Crossover)
UTP Implementation: Straight-Through vs. Crossover
Using Varieties of Cable Types
Summary
Chapter 01 Review

Chapter 02 - Ethernet LANs 3h 30m

Understanding the Challenges of Shared LANs
LAN Segment Limitations
Extending LAN Segments
Collisions
Multiple Collision Domains
Carrier Sense with Multiple Access with Collision Detection
Summary
Solving Network Challenges with Switched LAN Technology
Network Congestion
Bridges
Switches Supersede Bridges
LAN Switch
LAN Switch Features
Switching Frames
LANs Today
Summary
Exploring the Packet Delivery Process
Layer 2 Addressing
Layer 3 Addressing
Host-to-Host Packet Delivery
Summary
Operating Cisco IOS Software
Cisco IOS Software
Configuring Network Devices
An Overview of Cisco Device Startup
External Configuration Sources
Cisco IOS User Interface Functions
Cisco IOS Software EXEC Mode (User)
Cisco IOS Software EXEC Mode (Privileged)
Command-Line Help Facilities
Context-Sensitive Help
Console Error Messages
Enhanced Editing Commands
Hot Keys and Shortcuts
Router Command History
Demo - Basic CLI
Viewing the Configuration
Commands: show running-config and show startup-config
Summary
Starting a Switch
Initial Startup of the Cisco Catalyst Switch

Catalyst 2960 Switch LED Indicators
Initial Bootup Output from the Catalyst 2960 Switch
Initial Configuration of the Catalyst 2960 Switch Using Setup
Logging into the Switch and Entering the Privileged EXEC Mode
Configuring the Switch
Configuring Switch Identification
Configuring the Switch IP Address
Configuring the Switch Default Gateway
Saving Configurations
Showing Switch Initial Startup Status
Switch show version Command
Switch show interfaces Command
Switch show running-config Command
Managing the MAC Address Table
Clearing the MAC Address Table
Demo - Switch Configuration
Summary
Understanding Switch Security
Common Threats to Physical Installations
Configuring a Switch Password
Configuring the Login Banner
Telnet vs. SSH Access
Configuring Port Security
Verifying Port Security on the Catalyst 2960 Series
Port Security Violation Example
Verifying Port Security on the Catalyst 2960 Series (Cont.)
Securing Unused Ports
Disabling an Interface (Port)
Summary
Maximizing the Benefits of Switching
Microsegmentation
Duplex Overview
Setting Duplex and Speed Options
Showing Duplex Options
The Hierarchy of Connectivity
Loops
Spanning Tree Protocol
Summary
Troubleshooting Switch Issues
The Layered Approach
Port Access Issues
Duplex-Related Issues
Speed-Related Issues
Switched Media Issues
show interface
Excessive Noise
Excessive Collisions
Late Collisions
Configuration Recommended Practices
Example of Configuration Issues
Summary
Chapter 02 Review

Chapter 03 - Wireless LANs — 1h 10m

Exploring Wireless Networking
Market Trends
Differences Between WLAN and LAN
RF Transmission
Organizations That Define WLAN
ITU-R with FCC Wireless
IEEE 802.11 Standards Comparison
Wi-Fi Certification
Summary
Understanding WLAN Security
Wireless LAN Security Threats
Mitigating the Threats
Evolution of Wireless LAN Security
Wireless Client Association
How 802.1X Works on the WLAN
WPA and WPA2 Modes
WLAN Encryption Types
Summary
Implementing a WLAN
802.11 Topology Building Blocks
BSA Wireless Topology—Basic Coverage
ESA Wireless Topology—Extended Cover
Wireless Topology Data Rates—802.11b
Wireless Topology Data Rates and Range
Access Point Configuration
Steps to Implement a Wireless Network
Wireless Clients
Common Wireless Network Issues
Wireless Troubleshooting
Summary
VoIP Requirements
VoIP Phones Connected to the Network
VoIP Phone Requirements in the Network
Chapter 03 Review

Chapter 04 - LAN Connections — 4h 56m

Exploring the Functions of Routing
Routers
Router Functions
Path Determination
Routing Tables
Routing Table Entries
Routing Metrics
Distance Vector Routing Protocols
Link-State Routing Protocols
Summary
Understanding Binary Basics
Decimal vs. Binary Numbers
Powers of 2
Decimal and Binary Numbers Chart
Decimal-to-Binary Conversion
Binary-to-Decimal Conversion
Demo - Conversion
Summary
Constructing a Network Addressing Scheme

Flat Topology
Subnetworks
What a Subnet Mask Does
End System Subnet Mask Operation
How Routers Use Subnet Masks
Applying the Subnet Address Scheme
Demo - Subnetting Part 1
Octet Values of a Subnet Mask
Default Subnet Masks
Possible Subnets and Hosts for a Class C Network
Possible Subnets and Hosts for a Class B Network
Possible Subnets and Hosts for a Class A Network
Procedure for Implementing Subnets
Eight Easy Steps for Determining Subnet Addresses - Example
Example: Applying a Subnet Mask for a Class C Address
Example: Applying a Subnet Mask for a Class B Address
Example: Applying a Subnet Mask for a Class A Address
Demo - Subnetting Part 2
Demo - Subnetting Part 3
Summary

Starting a Cisco Router

Initial Startup of the Cisco Router
Bootup Output from the Router
Setup Script Review and Use
Logging into the Cisco Router
Router User-Mode Command List
Router Privileged-Mode Command List
show version Command
Demo - Router Configuration
Summary

Configuring a Cisco Router

Overview of Router Modes
Saving Configurations
Configuring Router Identification
Console-Line Commands
Configuring an Interface
Disabling or Enabling an Interface
Configuring IP Addresses
Router show interfaces Command
Interpreting the Interface Status
Verifying a Serial Interface Configuration
Summary

Exploring the Packet Delivery Process

Layer 2 Addressing
Layer 3 Addressing
Host-to-Host Packet Delivery
Using the show ip arp Command
The ping Command
The traceroute Command
Summary

Understanding Cisco Router Security

Common Threats to Physical Installations
Configuring a Router Password
Cisco AutoSecure
Configuring the MOTD Banner
Telnet vs. SSH Access
Demo - Passwords

Summary
Using Cisco SDM
Cisco Router and Security Device Manager
What Is Cisco SDM?
Supported Cisco Routers and Cisco IOS Software Releases
Cisco Configuration Professional
Configuring Your Router to Support SDM
Cisco SDM Startup
Cisco SDM Main Window Layout and Navigation
Cisco SDM Wizards
Summary
Using a Cisco Router as a DHCP Server
Understanding DHCP
DHCP
Using a Router as a DHCP Server
DHCP Server Using a Router
Additional Tasks
DHCP Pool
Cisco IOS DHCP Server Configuration
Checking the DHCP Configuration
DHCP Pool Status
The show ip dhcp binding Command
The show ip dhcp conflict Command
Summary
Accessing Remote Devices
Using Telnet to Connect to Remote Devices
Using SSH to Connect to Remote Devices
Viewing Telnet Connections
Viewing SSH Connections
Suspending and Resuming a Telnet Session
Demo - Telnet
Closing a Telnet Session
Using the ping and traceroute Commands
Summary
Chapter 04 Review

Chapter 05 - WAN Connections 3h 15m

Understanding WAN Technologies
WAN
Need for WANs
WANs vs. LANs
Enterprise LANs and WANs
WAN Access and the OSI Reference Model
WAN Devices
Physical Layer: WANs
Serial Point-to-Point Connections
WAN—Multiple LANs
WAN Data-Link Protocols
WAN Link Options
Last Mile and Long-Range WAN Technologies
Summary
Enabling the Internet Connection
Packet Switching
DSL
DSL Service Types Overview
DSL Considerations

Cable-Based WANs
The Global Internet
Internet Interface Address
Network Address Translation
Port Address Translation
Translating Inside Source Addresses
Overloading an Inside Global Address
Gathering the Required Information
Configuring the Client: Interface and Connection
Configuring the Client: WAN Wizard
Configuring the Client: Encapsulation
Configuring the Client: IP Addressing
Configuring PAT: Advanced Options
Configuring PAT: Summary
Verifying the DHCP Client Configuration
Displaying Information with show Commands
Summary
Enabling Static Routing
Router Operations
Identifying Static and Dynamic Routes
Static Routes
Static Route Configuration
Static Route Example
Verifying Static Routes in the Routing Table
Default Routes
Verifying the Default Route Configuration
Demo - Static Routes
Summary
Configuring Serial Encapsulation
Circuit Switching
Public Switched Telephone Network
PSTN Considerations
Leased Line
WAN Connection Bandwidth
Configuring a Serial Interface
Serial Interface show controller Command
Point-to-Point Considerations
HDLC and Cisco HDLC
Verifying the HDLC Encapsulation Configuration
Connection to Router from Other Vendor
An Overview of PPP
PPP Layered Architecture
Enable PPP Encapsulation
PPP Configuration Example
Verifying a Serial Interface Configuration
Demo - Configuring Serial
Summary
Enabling RIP
What Is a Routing Protocol?
Purpose of a Dynamic Routing Protocol
Autonomous Systems: Interior and Exterior Routing Protocols
Classes of Routing Protocols
Administrative Distance: Ranking Routes
Classful Routing Protocol
Classless Routing Protocol
Distance Vector Routing Protocols
Sources of Information and Discovering Routes

RIP Overview
RIPv1 and RIPv2 Comparison
IP Routing Configuration Tasks
RIP Configuration
RIP Configuration Example
Verifying the RIP Configuration
Displaying the IP Routing Table
debug ip rip Command
Demo - RIP
Summary
Chapter 05 Review

Chapter 06 - Network Environment Management 1h 9m

Discovering Neighbors on the Network
Creating a Network Map
Cisco Discovery Protocol
Discovering Neighbors with Cisco Discovery Protocol
Using Cisco Discovery Protocol
Disabling Cisco Discovery Protocol
Using the show cdp neighbors Command
Using the show cdp entry Command
Additional Cisco Discovery Protocol Commands
Demo - CDP
Summary
Managing Cisco Router Startup and Configuration
Router Internal Components
ROM Functions
Router Power-On Boot Sequence
Finding the Cisco IOS Image
Loading the Cisco IOS Image from Flash Memory
Verifying Router Bootup Process
Loading the Configuration
show running-config and show startup-config Commands
Determining the Current Configuration Register Value
Configuration Register Values
show flash Command
Summary
Managing Cisco Devices
Cisco IOS Integrated File System and Devices
Managing Cisco IOS Images
Verifying Memory and Deciphering Image Filenames
Cisco IOS Copy Command
Creating a Software Image Backup
Upgrading the Image from the Network
Device Configuration Files
Managing Configuration Files
Cisco IOS Copy Command Example
copy run tftp and copy tftp run Commands
Show and Debug Commands
Considerations When Using debug Commands
Commands Related to Debug
Summary
Chapter 06 Review
Course Closure

Total Duration: 19hrs 28m