



Interconnecting Cisco Networking Devices (ICND Part 1) (5-day class)

Students can earn the CCENT (Cisco Certified Entry Network Technician) certification by passing the related Cisco exam. The CCENT is the first step to achieving the CCNA (Cisco Certified Network Associate) credential, and the ICND1 exam is one of two individual exams required to obtain the CCNA certification.

INTRODUCTION

This course covers the steps to successfully install, operate, and troubleshoot a small branch office network. It includes topics on networking fundamentals; connecting to a WAN; basic security and wireless concepts; routing and switching fundamentals; the TCP/IP and OSI models; IP addressing; WAN technologies; operating and configuring IOS devices; configuring RIPv2, static and default routing; implementing NAT and DHCP; and configuring simple networks.

(The courseware used is Cisco Press; hands-on labs, scenarios, and exam-prep activities developed by Signal Learning Center are incorporated into the class to provide a comprehensive, instructor-led, learning experience.)

COURSE OBJECTIVES

Upon successful completion of this course, students will be able to:

- Describe the operation of data networks
- Implement a small switched network
- Implement an IP addressing scheme and IP services to meet network requirements for a small branch office
- Implement a small routed network
- Explain and select the appropriate administrative tasks required for a WLAN
- Identify security threats to a network and describe general methods to mitigate those threats
- Implement and verify WAN links

PREREQUISITES

There are no prerequisites for this class. However, a basic understanding of computer systems and networks technologies is expected.



COURSE OUTLINE

Part I Networking Fundamentals

Chapter 1 Introduction to Computer Networking Concepts

Perspectives on Networking

Chapter 2 The TCP/IP and OSI Networking Models

Foundation Topics

The TCP/IP Protocol Architecture

The TCP/IP Application Layer

The TCP/IP Transport Layer

The TCP/IP Internet Layer

The TCP/IP Network Access Layer

Data Encapsulation Terminology

The OSI Reference Model

Comparing OSI and TCP/IP

OSI Layers and Their Functions

OSI Layering Concepts and Benefits

OSI Encapsulation Terminology

Exam Preparation Tasks

Chapter 3 Fundamentals of LANs

Foundation Topics

An Overview of Modern Ethernet LANs

A Brief History of Ethernet

The Original Ethernet Standards: 10BASE2 and 10BASE5

Repeaters

Building 10BASE-T Networks with Hubs

Ethernet UTP Cabling

UTP Cables and RJ-45 Connectors

Transmitting Data Using Twisted Pairs

UTP Cabling Pinouts for 10BASE-T and 100BASE-TX

1000BASE-T Cabling

Improving Performance by Using Switches Instead of Hubs

Increasing Available Bandwidth Using Switches



Doubling Performance by Using Full-Duplex Ethernet

Ethernet Layer 1 Summary

Ethernet Data-Link Protocols

Ethernet Addressing

Ethernet Framing

Identifying the Data Inside an Ethernet Frame

Error Detection

Exam Preparation Tasks

Chapter 4 Fundamentals of WANs

Foundation Topics

OSI Layer 1 for Point-to-Point WANs

WAN Connections from the Customer Viewpoint

WAN Cabling Standards

Clock Rates, Synchronization, DCE, and DTE

Building a WAN Link in a Lab

Link Speeds Offered by Telcos

OSI Layer 2 for Point-to-Point WANs

HDLC

Point-to-Point Protocol

Point-to-Point WAN Summary

Frame Relay and Packet-Switching Services

The Scaling Benefits of Packet Switching

Frame Relay Basics

Exam Preparation Tasks

Chapter 5 Fundamentals of IP Addressing and Routing

Foundation Topics

Overview of Network Layer Functions

Routing (Forwarding)

PC1's Logic: Sending Data to a Nearby Router

R1 and R2's Logic: Routing Data Across the Network

R3's Logic: Delivering Data to the End Destination

Network Layer Interaction with the Data Link Layer

IP Packets and the IP Header



3840 Edison Lakes Parkway, Mishawaka, IN 46545

12800 N. Meridian, Carmel, IN 46032

www.signallearning.com

Network Layer (Layer 3) Addressing

Routing Protocols

IP Addressing

IP Addressing Definitions

How IP Addresses Are Grouped

Classes of Networks

The Actual Class A, B, and C Network Numbers

IP Subnetting

IP Routing

Host Routing

Router Forwarding Decisions and the IP Routing Table

IP Routing Protocols

Network Layer Utilities

Address Resolution Protocol and the Domain Name System

DNS Name Resolution

The ARP Process

Address Assignment and DHCP

ICMP Echo and the ping Command

Exam Preparation Tasks

Chapter 6 Fundamentals of TCP/IP Transport, Applications, and Security

Foundation Topics

TCP/IP Layer 4 Protocols: TCP and UDP

Transmission Control Protocol

Multiplexing Using TCP Port Numbers

Popular TCP/IP Applications

Error Recovery (Reliability)

Flow Control Using Windowing

Connection Establishment and Termination

Data Segmentation and Ordered Data Transfer

User Datagram Protocol

TCP/IP Applications

QoS Needs and the Impact of TCP/IP Applications

The World Wide Web, HTTP, and SSL

Universal Resource Locators



3840 Edison Lakes Parkway, Mishawaka, IN 46545

12800 N. Meridian, Carmel, IN 46032

www.signallearning.com

Finding the Web Server Using DNS

Transferring Files with HTTP

Network Security

Perspectives on the Sources and Types of Threats

Firewalls and the Cisco Adaptive Security Appliance (ASA)

Anti-x

Intrusion Detection and Prevention

Virtual Private Networks (VPN)

Exam Preparation Tasks

Part II LAN Switching

Chapter 7 Ethernet LAN Switching Concepts

Foundation Topics

LAN Switching Concepts

Historical Progression: Hubs, Bridges, and Switches

Switching Logic

The Forward Versus Filter Decision

How Switches Learn MAC Addresses

Flooding Frames

Avoiding Loops Using Spanning Tree Protocol

Internal Processing on Cisco Switches

LAN Switching Summary

LAN Design Considerations

Collision Domains and Broadcast Domains

Collision Domains

Broadcast Domains

The Impact of Collision and Broadcast Domains on LAN Design

Virtual LANs (VLAN)

Campus LAN Design Terminology

Ethernet LAN Media and Cable Lengths

Exam Preparation Tasks

Chapter 8 Operating Cisco LAN Switches

Foundation Topics



3840 Edison Lakes Parkway, Mishawaka, IN 46545
12800 N. Meridian, Carmel, IN 46032
www.signallearning.com

Accessing the Cisco Catalyst 2960 Switch CLI

Cisco Catalyst Switches and the 2960 Switch

Switch Status from LEDs

Accessing the Cisco IOS CLI

CLI Access from the Console

Accessing the CLI with Telnet and SSH

Password Security for CLI Access

User and Enable (Privileged) Modes

CLI Help Features

The debug and show Commands

Configuring Cisco IOS Software

Configuration Submodes and Contexts

Storing Switch Configuration Files

Copying and Erasing Configuration Files

Initial Configuration (Setup Mode)

Exam Preparation Tasks

Chapter 9 Ethernet Switch Configuration

Foundation Topics

Configuration of Features in Common with Routers

Securing the Switch CLI

Configuring Simple Password Security

Configuring Usernames and Secure Shell (SSH)

Password Encryption

The Two Enable Mode Passwords

Console and vty Settings

Banners

History Buffer Commands

The logging synchronous and exec-timeout Commands

LAN Switch Configuration and Operation

Configuring the Switch IP Address

Configuring Switch Interfaces

Port Security

VLAN Configuration

Securing Unused Switch Interfaces



3840 Edison Lakes Parkway, Mishawaka, IN 46545

12800 N. Meridian, Carmel, IN 46032

www.signallearning.com

Exam Preparation Tasks

Chapter 10 Ethernet Switch Troubleshooting

Foundation Topics

Perspectives on Network Verification and Troubleshooting

Attacking Sim Questions

Simlet Questions

Multiple-Choice Questions

Approaching Questions with an Organized Troubleshooting Process

Isolating Problems at Layer 3, and Then at Layers 1 and 2

Troubleshooting as Covered in This Book

Verifying the Network Topology with Cisco Discovery Protocol

Analyzing Layer 1 and 2 Interface Status

Interface Status Codes and Reasons for Nonworking States

Interface Speed and Duplex Issues

Common Layer 1 Problems on Working Interfaces

Analyzing the Layer 2 Forwarding Path with the MAC Address Table

Analyzing the Forwarding Path

Port Security and Filtering

Exam Preparation Tasks

Chapter 11 Wireless LANs

Foundation Topics

Wireless LAN Concepts

Comparisons with Ethernet LANs

Wireless LAN Standards

Modes of 802.11 Wireless LANs

Wireless Transmissions (Layer 1)

Wireless Encoding and Nonoverlapping DSSS Channels

Wireless Interference

Coverage Area, Speed, and Capacity

Media Access (Layer 2)

Deploying WLANs

Wireless LAN Implementation Checklist

Step 1: Verify the Existing Wired Network



Step 2: Install and Configure the AP's Wired and IP Details

Step 3: Configure the AP's WLAN Details

Step 4: Install and Configure One Wireless Client

Step 5: Verify That the WLAN Works from the Client

Wireless LAN Security

WLAN Security Issues

The Progression of WLAN Security Standards

Wired Equivalent Privacy (WEP)

SSID Cloaking and MAC Filtering

The Cisco Interim Solution Between WEP and 802.11i

Wi-Fi Protected Access (WPA)

IEEE 802.11i and WPA-2

Exam Preparation Tasks

Part III IP Routing

Chapter 12 IP Addressing and Subnetting

Foundation Topics

Exam Preparation Tools for Subnetting

Suggested Subnetting Preparation Plan

More Practice Using a Subnet Calculator

IP Addressing and Routing

IP Addressing Review

Public and Private Addressing

IP Version 6 Addressing

IP Subnetting Review

IP Routing Review

Math Operations Used When Subnetting

Converting IP Addresses and Masks from Decimal to Binary and Back Again

Performing a Boolean AND Operation

Prefix Notation/CIDR Notation

Binary Process to Convert Between Dotted Decimal and Prefix Notation

Decimal Process to Convert Between Dotted Decimal and Prefix Notation

Practice Suggestions

Analyzing and Choosing Subnet Masks



Analyzing the Subnet Mask in an Existing Subnet Design

The Three Parts: Network, Subnet, and Host

Binary Process: Finding the Number of Network, Subnet, and Host Bits

Decimal Process: Finding the Number of Network, Subnet, and Host Bits

Determining the Number of Subnets and Number of Hosts Per Subnet

Number of Subnets: Subtract 2, or Not?

Practice Examples for Analyzing Subnet Masks

Choosing a Subnet Mask that Meets Design Requirements

Finding the Only Possible Mask

Finding Multiple Possible Masks

Choosing the Mask that Maximizes the Number of Subnets or Hosts

Practice Suggestions

Analyzing Existing Subnets

Finding the Subnet Number: Binary

Finding the Subnet Number: Binary Shortcut

Finding the Subnet Broadcast Address: Binary

Finding the Range of Valid IP Addresses in a Subnet

Finding the Subnet, Broadcast Address, and Range of Addresses: Decimal Process

Decimal Process with Easy Masks

Decimal Process with Difficult Masks

Finding the Broadcast Address: Decimal

Summary of Decimal Processes to Find the Subnet, Broadcast, and Range

Practice Suggestions

Design: Choosing the Subnets of a Classful Network

Finding All Subnets with Fewer Than 8 Subnet Bits

Finding All Subnets with Exactly 8 Subnet Bits

Practice Suggestions

Finding All Subnets with More Than 8 Subnet Bits

More Practice Suggestions

Exam Preparation Tasks

Chapter 13 Operating Cisco Routers

Foundation Topics

Installing Cisco Routers

Installing Enterprise Routers



3840 Edison Lakes Parkway, Mishawaka, IN 46545

12800 N. Meridian, Carmel, IN 46032

www.signallearning.com

Cisco Integrated Services Routers

Physical Installation

Installing Internet Access Routers

A SOHO Installation with a Separate Switch, Router, and Cable Modem

A SOHO Installation with an Integrated Switch, Router, and DSL Modem

Regarding the SOHO Devices Used in This Book

Cisco Router IOS CLI

Comparisons Between the Switch CLI and Router CLI

Router Interfaces

Interface Status Codes

Router Interface IP Addresses

Bandwidth and Clock Rate on Serial Interfaces

Router Auxiliary (Aux) Port

Initial Configuration (Setup Mode)

Upgrading Cisco IOS Software and the Cisco IOS Software Boot Process

Upgrading a Cisco IOS Software Image into Flash Memory

The Cisco IOS Software Boot Sequence

The Three Router Operating Systems

The Configuration Register

How a Router Chooses Which OS to Load

The show version Command and Seeing the Configuration Register's Value

Exam Preparation Tasks

Chapter 14 Routing Protocol Concepts and Configuration

Foundation Topics

Connected and Static Routes

Connected Routes

Static Routes

Extended ping Command

Default Routes

Routing Protocol Overview

RIP-2 Basic Concepts

Comparing and Contrasting IP Routing Protocols

Interior and Exterior Routing Protocols

Routing Protocol Types/Algorithms



3840 Edison Lakes Parkway, Mishawaka, IN 46545

12800 N. Meridian, Carmel, IN 46032

www.signallearning.com

Metrics

Autosummarization and Manual Summarization

Classless and Classful Routing Protocols

Convergence

Miscellaneous Comparison Points

Summary of Interior Routing Protocols

Configuring and Verifying RIP-2

RIP-2 Configuration

Sample RIP Configuration

RIP-2 Verification

Interpreting the Output of the show IP route Command

Administrative Distance

The show ip protocols Command

Examining RIP Messages with debug

Exam Preparation Tasks

Chapter 15 Troubleshooting IP Routing

Foundation Topics

IP Troubleshooting Tips and Tools

IP Addressing

Avoiding Reserved IP Addresses

One Subnet, One Mask, for Each LAN

Summary of IP Addressing Tips

Host Networking Commands

Troubleshooting Host Routing Problems

Finding the Matching Route on a Router

Troubleshooting Commands

The show IP arp Command

The traceroute Command

Telnet and Suspend

A Routing Troubleshooting Scenario

Scenario Part A: Tasks and Questions

Scenario Part A: Answers

Scenario Part B: Analyze Packet/Frame Flow

Scenario Part B: Answers



3840 Edison Lakes Parkway, Mishawaka, IN 46545

12800 N. Meridian, Carmel, IN 46032

www.signallearning.com

Scenario Part B: Question 1
Scenario Part B: Question 2
Scenario Part B: Question 3
Scenario Part B: Question 4
Scenario Part B: Question 5
Scenario Part B: Question 6
Scenario Part B: Question 7
Scenario Part C: Analyze Connected Routes
Scenario Part C: Answers

Exam Preparation Tasks

Part IV Wide-Area Networks

Chapter 16 WAN Concepts

Foundation Topics

WAN Technologies
Perspectives on the PSTN
Analog Modems
Digital Subscriber Line
DSL Types, Speeds, and Distances
DSL Summary
Cable Internet
Comparison of Remote-Access Technologies
ATM
Packet Switching Versus Circuit Switching
Ethernet as a WAN Service

IP Services for Internet Access

Address Assignment on the Internet Access Router
Routing for the Internet Access Router
NAT and PAT

Exam Preparation Tasks

Chapter 17 WAN Configuration

Foundation Topics

Configuring Point-to-Point WANs



3840 Edison Lakes Parkway, Mishawaka, IN 46545
12800 N. Meridian, Carmel, IN 46032
www.signallearning.com

Configuring HDLC

Configuring PPP

Configuring and Troubleshooting Internet Access Routers

Internet Access Router: Configuration Steps

Step 1: Establish IP Connectivity

Step 2: Install and Access SDM

Step 3: Configure DHCP and PAT

Step 4: Plan for DHCP Services

Step 5: Configure the DHCP Server

Internet Access Router Verification

Exam Preparation Tasks

Part V Final Preparation

Chapter 18 Final Preparation

Tools for Final Preparation

Exam Engine and Questions on the CD

Install the Software from the CD

Activate and Download the Practice Exam

Activating Other Exams

The Cisco CCNA Prep Center

Subnetting Videos, Reference Pages, and Practice Problems

Scenarios

Study Plan

Recall the Facts

Practice Subnetting

Build Troubleshooting Skills Using Scenarios

Use the Exam Engine

Choosing Study or Simulation Mode

Choosing the Right Exam Option

Summary



3840 Edison Lakes Parkway, Mishawaka, IN 46545

12800 N. Meridian, Carmel, IN 46032

www.signallearning.com