CCNA 1: Networking Basics

Cisco Networking Academy Program
Version 3.0

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Target Audience

Anyone desires a practical, technical introduction to the field of networking. High-school, community college, and lifelong-learning students interested in careers as network technicians, network engineers, network administrators, and network help-desk staff.

Prerequisites

- Students should have Reading Age Level (RAL) of 13.
- Basic computer literacy, and awareness of the Internet.
- Prior experience with computer hardware, binary math, and basic electronics desired but not required.
- Background in cabling beneficial.

Course Description

CCNA 1: Networking Basics is the first of the four courses leading to the Cisco Certified Network Associate (CCNA) designation. CCNA 1 introduces Cisco Networking Academy Program students to the networking field. The course focuses on network terminology and protocols, local-area networks (LANs), wide-area networks (WANs), Open System Interconnection (OSI) models, cabling, cabling tools, routers, router programming, Ethernet, Internet Protocol (IP) addressing, and network standards.

In addition, instruction and training are provided in the proper care, maintenance, and use of networking software, tools, and equipment and all local, state, and federal safety, building, and environmental codes and regulations.

Course Objectives

The CCNA certification indicates knowledge of networking for the small-office, home-office (SOHO) market and the ability to work in small businesses or organizations whose networks have fewer than 100 nodes. A CCNA certified individual can:

- Install and configure Cisco switches and routers in multiprotocol internetworks using LAN and WAN interfaces
- Provide Level 1 troubleshooting service
- Improve network performance and security
- Perform entry-level tasks in the planning, design, installation, operation and troubleshooting of Ethernet, TCP/IP Networks.

CCNA 1 is an integral step towards achieving CCNA Certification.

Upon completion of this course, students will be able to perform tasks related to:

- Networking Mathematics, Terminology, and Models
- Networking Media: copper, optical, and wireless
- Cable testing and cabling LANs and WANs
- Ethernet Operation and 10/100/1000/10 G versions of Ethernet
- Ethernet Switching
- IP Addressing, Subnetting
- TCP/IP Protocols: IP, TCP and UDP, Application Layer Protocols

Course Overview

The course has been designed for 70 contact hours. Approximately 35 hours will be designated to lab activities and 35 hours on curriculum content. A case study on structured cabling is required, but format and timing are determined by the Local Academy.

What has changed from CCNA versions 2.x?

- More information on optical and wireless
- More cable testing terminology and concepts
- More details on the operation of Ethernet
- Focus on Fast, Gigabit, and 10 Gigabit Ethernet
- Structured cabling resource materials moved to case study
- Case study required; format and timing determined by Local Academy
- More interactive flash activities
- Lab focus on cable-making, building small networks, interconnecting devices

Course Outline

Module 1. Introduction to Networking

Overview

1.1 Your Connection to the Internet

- 1.1.1 The Internet
- 1.1.2 Requirements for Internet connection
- 1.1.3 PC basics
- 1.1.4 Network interface card
- 1.1.5 NIC and modem installation
- 1.1.6 High-speed and dialup connectivity
- 1.1.7 TCP/IP description and configuration
- 1.1.8 Testing connectivity with Ping
- 1.1.9 Web browser and plug-Ins
- 1.1.10 Troubleshooting Internet connection problems

1.2 Networking Math

- 1.2.1 Binary representation of data
- 1.2.2 Bits and bytes
- 1.2.3 Base 10 number system
- 1.2.4 Base 2 number system
- 1.2.5 Converting decimal to 8-bit binary numbers
- 1.2.6 Converting 8-bit binary numbers to decimal
- 1.2.7 Four-octet dotted decimal representations of 32-bit binary numbers
- 1.2.8 Hexadecimal
- 1.2.9 Boolean (binary) logic
- 1.2.10 IP addresses and subnet masks

Summary

Module 2. Networking Fundamentals

Overview

2.1 Networking Terminology

- 2.1.1 Data networks
- 2.1.2 Network history
- 2.1.3 Networking devices

Module 5. Cabling LANs and WANs

5.2 Cabling the WAN

5.2.1 WAN physical layer

5.2.2 WAN serial connections

5.2.3 Routers and serial connections

5.2.4 Routers and ISDN BRI connections

5.2.5 Routers and DSL connections

5.2.6 Routers and Cable connections

5.2.7 Setting up console connections

Summary

Module 6. Ethernet Fundamentals

Overview

6.1 Ethernet Fundamentals

6.1.1 Introduction to Ethernet

6.1.2 IEEE Ethernet naming rules

6.1.3 Ethernet and the OSI model

6.1.4 Naming

6.1.5 Framing in general

6.1.6 Ethernet frame structure

6.1.7 Ethernet frame fields

6.2 Ethernet Operation

6.2.1 Media Access Control

6.2.2 MAC rules and collision detection/backoff

6.2.3 Ethernet timing

6.2.4 Interframe Spacing and Backoff

6.2.5 Error Handling

6.2.6 Types of collisions

6.2.7 Ethernet errors

6.2.8 Ethernet errors: FCS and beyond

6.2.9 Ethernet auto-negotiation

6.2.10 Link Establishment and full/half duplex

Summary

Module 7. Ethernet Technologies

Overview

7.1 10 Mbps and 100 Mbps Ethernet

7.1.1 10 Mbps Ethernet

7.1.2 10BASE5

7.1.3 10BASE2

7.1.4 10BASE-T

7.1.5 10BASE-T wiring and architecture

7.1.6 100 Mbps Ethernet

7.1.7 100BASE-TX

7.1.8 100BASE-FX

7.1.9 Fast Ethernet architecture

7.1.10 Network and protocol analysis software

7.2 1000 Mbps and 10 Gigabit Ethernet

7.2.1 1000 Mbps Ethernet

7.2.2 1000BASE-T

7.2.3 1000BASE-SX and LX

7.2.4 Gigabit Ethernet architecture

7.2.5 10 Gigabit Ethernet

7.2.6 10 Gigabit Ethernet architectures

7.2.7 Future of Ethernet

Summary

Module 8. Ethernet Switching

Overview

8.1 Ethernet Switching

8.1.1 L2 bridging

8.1.2 L2 switching

8.1.3 Switch operation

8.1.4 Latency

8.1.5 Switch modes

8.1.6 Spanning Tree Protocol

8.2 Collision Domains and Broadcast Domains

8.2.1 Shared media environments

8.2.2 Collision domains

8.2.3 Segmentation

8.2.4 Layer 2 broadcast

8.2.5 Broadcast domains

8.2.6 Introduction to data flow

8.2.7 What is the meaning of a network "segment?"

Summary

Module 9. TCP/IP Protocol Suite and IP Addressing

Overview

9.1 Introduction to TCP/IP

9.1.1 History and future of TCP/IP

9.1.2 Application layer

9.1.3 Transport layer

9.1.4 Internet layer

9.1.5 Network access layer

9.1.6 Comparing the OSI seven layer and the TCP/IP four layer models

9.1.7 Internet architecture

9.2 Internet Addresses

9.2.1 IP addressing

9.2.2 Decimal and binary conversion review

9.2.3 IP v4 addressing

9.2.4 Address class higher-order bits; Class A, B, C, D, and E

9.2.5 Reserved IP addresses

9.2.6 Public/private IP addresses

9.2.7 Introduction to subnetting

9.2.8 IP v4 vs. IP v6

9.3 Obtaining an IP Address

9.3.1 Getting an Internet address

9.3.2 Static assignment of an IP address

9.3.3 RARP IP address assignment

9.3.4 Bootstrap Protocol (BOOTP) IP address assignment

9.3.5 Dynamic Host Configuration Protocol (DHCP) IP aAddress Management

9.3.6 Problems in address resolution

9.3.7 ARP

Summary

Module 10. Routing Fundamentals and Subnets

Overview

10.1 Routed Protocol

- 10.1.1 Routable/routed protocols
- 10.1.2 IP as a routed protocol
- 10.1.3 Packet propagation and switching with a router
- 10.1.4 Internet Protocol (IP)
- 10.1.5 Anatomy of an IP packet

10.2 IP Routing Protocols

- 10.2.1 Routing overview
- 10.2.2 Routing versus switching
- 10.2.3 Routed versus routing
- 10.2.4 Path determination
- 10.2.5 Routing tables
- 10.2.6 Routing algorithms and metrics
- 10.2.7 IGP and EGP
- 10.2.8 Link-state and distance vector
- 10.2.9 Routing protocols

10.3 Mechanics of Subnetting

- 10.3.1 Classes of network IP addresses
- 10.3.2 Introduction to and reason for subnetting
- 10.3.3 Establishing the subnet mask address
- 10.3.4 Applying the subnet mask
- 10.3.5 Subnetting Class A and B networks
- 10.3.6 The logical ANDing process

Summary

Module 11. TCP/IP Transport and Application Layer

Overview

11.1 TCP/IP Transport Layer

- 11.1.1 Transport layer functions
- 11.1.2 Flow control
- 11.1.3 Session establishment, maintenance, and termination Overview
- 11.1.4 3-way handshake
- 11.1.5 Windowing

11.1.6 Acknowledgement

11.1.7 TCP (Transmission Control Protocol)

11.1.8 UDP (User Datagram Protocol)

11.1.9 TCP and UDP port numbers

11.2 TCP/IP Application Layer

11.2.1 Intro to TCP/IP application layer

11.2.2 DNS

11.2.3 FTP

11.2.4 HTTP

11.2.5 SMTP

11.2.6 SNMP

11.2.7 Telnet

Summary

Case Study: Structured Cabling

