Computer Networking for Beginners

Instructor: Alton Hardin

Course Curriculum

Section 1: Course Introduction
- Course Introduction and Overview
- Beginner-Friendly Labs
- Course Lecture PDFs

Section 2: Overview and Benefits of Computer Networks
- What Is a Computer Network?
- Some Basic Computer Networking Rules
- Types of Networks (by Size)
- Peer-to-Peer vs. Client-Server Architecture
- Why Build a Computer Network?

Section 3: Course Primer: How Computer Networks Work
- Section Introduction
- Introduction to Computer Networking Protocols
- Introduction to the OSI Model
- Introduction to the TCP/IP Model
- Introduction to MAC Addresses
- Introduction to IP Addresses
- IP versus MAC Addresses
- Duplex Communication
- Network Transmission Types
- Introduction to Ethernet
- **Lab #1**: Installing Cisco Packet Tracer
- Cisco Packet Tracer on Mac OS
- **Lab # 2**: Connecting two PCs Together

Section 4: Network Topologies
- Section Introduction
- Physical vs. Logical Topologies
- Wired Network Topologies
- Wireless Network Topologies
- **Lab # 3**: Create Physical Wired Topologies

Section 5: Networking Devices

- Section Introduction
- Network Interface Cards (NICs)
- Hubs
- Switches
- Wireless Access Points
- Wireless Range Extenders
- Routers
- Modems
- All-in-One SOHO Devices
- Media Converters
- Firewalls
- DHCP Servers
- VoIP Endpoints
- **Lab # 4**: Creating a Simple Home LAN

Section 6: Network Cabling

- Section Introduction
- Types of Network Cabling
- Ethernet Standards
- Coaxial Cabling
- Twisted Pair Copper Network Cabling
- Wiring Standards: 568A & 568B and Cable Types
- **Live Demonstration**: Creating a Network Cable
- Plenum-Rated Cabling
- Fiber Optic Network Cabling
- Networking Cable Selection Criteria
1. **Lab # 5**: Exploring Network Cabling

Section 7: The OSI Model

- Section Introduction
- OSI Layer 7 - The Application Layer
- OSI Layer 6 - The Presentation Layer
- OSI Layer 5 - The Session Layer
- OSI Layer 4 - The Transport Layer
- OSI Layer 3 - The Network Layer
- OSI Layer 2 - The Data Link Layer
- OSI Layer 1 - The Physical Layer
- OSI Model Data Encapsulation and De-Encapsulation

Section 8: Introduction to TCP/IP

- Section Introduction
- What is TCP/IP?
- TCP/IP Protocols
- Network Access Methods

Section 9: TCP/IP Network Layer Protocols

- Address Resolution Protocol (ARP)
- **ARP Live Demo:** ARP Command on Windows, Linux, and Mac
- The Internet Protocol (IP)
- Internet Control Message Protocol (ICMP)
- **Ping Live Demo:** Ping Command on Windows and Mac

Section 10: TCP/IP Transport Layer Protocols

- Understanding Protocols, Ports and Sockets
- TCP vs UDP
- Closing TCP Sessions

Section 11: Common TCP/IP Application Layer Protocols

- Management Protocols
- Remote Communication Protocols
- File Transfer Protocols
- Email Protocols
- Web Browser Protocols

Section 12: Understanding IPv4 Addresses & Binary Math

- Section Introduction
- Understanding IPv4 Addresses & Binary Math
- Binary Math Basics

Section 13: A Deeper Dive into IPv4 Addresses and Subnet Masks

- IP Address Classification and Subnet Masks
- The Power of 2's
- Public versus Private IP Addresses
- Public versus Private IP Addresses Visualized
- The Loopback IP Address
- **Lab # 6**: Assigning Static IP Addresses to LAN

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Section 14: Introduction IPv4 to Subnetting

- Introduction to Subnetting
- Subnetting Reference Tables
- Subnetting a Class C Network #1
- Visualizing Subnetting a Class C Network #1
- Subnetting a Class C Network #2
- Visualizing Subnetting a Class C Network #2
- **Lab # 7**: Create Two LANs on Different Subnets

Section 15: IP Addressing Version 6 (IPv6) Fundamentals

- Section Introduction
- Disadvantages of IPv4 and IPv6 Solutions
- IPv6 Addressing
- IPv6 Transmission Types
- Types of Ipv6 Addresses
- IPv4 to IPv6 Translation & Compatibility
- IPv6 Neighbor Discovery Protocol

Section 16: Assigning IP Addresses

- Section Introduction
- Static vs. Dynamic IP Address Assignment
- IPv4 Dynamic IP Address Assignment
- **Live Demo**: IPv4 DHCP and APIPA
- **Live Demo**: Windows Server 2016 DHCP Server
- **Lab # 8**: Utilizing DHCP to Assign IP Addresses to LAN

Section 17: DNS Fundamentals

- Section Introduction
- DNS Overview and Hierarchy
- Common DNS Record Types
- **Live Demo**: NSLookup Command
- **Lab # 9**: DNS and Web Server Configuration

Section 18: Understanding Switches

- Section Introduction
- Refresher on Switches
- Collision Domains
- Broadcast Domains
- CSMA/CD
- Managed versus Unmanaged Switches
- How a Switch Learns MAC Addresses
- Virtual LANs (VLANs)
- Layer 3 Switches
- Port Mirroring
- Power over Ethernet (PoE)
- **Lab # 10:** Setting up Two Departmental VLANs

Section 19: Understanding Routers

- Section Introduction
- Refresher on Routers
- The Routing Process
- Static versus Dynamic Routing
- IGPs & EGPs
- Interior Gateway Protocols (IGPs)
- Border Gateway Protocol (BGP)
- Routing Tables and AD
- The Default Route
- **Lab # 11**: Configuring Routers with RIP

Section 20: Network Segmentation

- Section Introduction
- Network Address Translation (NAT)
- Demilitarized Zone (DMZ)
- Port Forwarding
- Access Control Lists (ACLs)

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Section 21: Wireless Networking and IoT

- Section Introduction
- Overview of Wireless Networking
- Understanding Service Set Types
- Wireless Frequencies and Channels
- 802.11 Standards and MIMO
- Deploying Wireless Networks
- Wireless Network Vulnerabilities & Security
- Internet of Things (IoT)
- **Lab # 12**: Adding a Wireless Access Point to a LAN

Section 22: Network Security

- Section Introduction
- The CIA Triad
- Least Privilege
- Acceptable Use Policy
- Defense in Depth
- Intranet, Extranet and the Internet
- VPN
- Firewalls
- Web Proxy Servers
- Network Intrusion Detection & Prevention
- **Lab # 13**: Configure Server Firewall to Block ICMP Requests

Section 23: Conclusion

- Congratulations!