Implementing and Administering Cisco Solutions v1.0 (CCNA)

Modality: Virtual Classroom

Duration: 5 Days

CLC: 43 Units

About this course:

Implementing and Administering Cisco Solutions (CCNA) v1.0 is a 5-day class that teaches learners how to install, operate, configure, and verify a basic IPv4 and IPv6 network, including configuring a network components, such as switch, router, and Wireless LAN Controller; managing network devices, and identifying basic security threats. Today's job roles are ever changing. The new CCNA will now cover wireless, overview of SD-WAN, DNA Center and Security threats.

The goal of the course is to provide learners with the knowledge and skills that are necessary to install, configure, and operate a small to medium-sized network.

Course Objective:

Upon completing this course, the learner will be able to meet these overall objectives:

- Identify the components of a computer network and describe their basic characteristics
- Understand the model of host-to-host communication
- Describe the features and functions of the Cisco Internetwork Operating System (IOS®) software
- Describe LANs and the role of switches within LANs
- Describe Ethernet as the network access layer of TCP/IP and describe the operation of switches
- Install a switch and perform the initial configuration
- Describe the TCP/IP Internet layer, IPv4, its addressing scheme, and subnetting
- Describe the TCP/IP Transport layer and Application layer
- Explore functions of routing
- Implement basic configuration on a Cisco router
- Explain host-to-host communications across switches and routers
- Identify and resolve common switched network issues and common problems associated with IPv4 addressing
- Describe IPv6 main features and addresses, and configure and verify basic IPv6 connectivity
- Describe the operation, benefits, and limitations of static routing
- Describe, implement, and verify Virtual Local Area Networks (VLANs) and trunks
- Describe the application and configuration of inter-VLAN routing
- Explain the basics of dynamic routing protocols and describe components and terms of Open Shortest Path First (OSPF)
- Explain how Spanning Tree Protocol (STP) and Rapid Spanning Tree Protocol (RSTP) work
- Configure link aggregation using EtherChannel
- Describe the purpose of Layer 3 redundancy protocols
- Describe basic WAN and VPN concepts

- Describe the operation of Access Control Lists (ACLs) and their applications in the network
- Configure Internet access using Dynamic Host Configuration Protocol (DHCP) clients and explain and configure Network Address Translation (NAT) on Cisco routers
- Describe basic Quality of Service (QoS) concepts
- Describe the concepts of wireless networks, which types of wireless networks can be built, and how to use Wireless LAN Controllers (WLCs)
- Describe network and device architectures and introduce virtualization
- Introduce the concept of network programmability and Software-Defined Networking (SDN) and describe smart network management solutions such as Cisco DNA Center™, Software-Defined Access (SD-Access), and Software-Defined Wide Area Network (SD-WAN)
- Configure basic IOS system monitoring tools
- Describe the management of Cisco devices
- Describe the current security threat landscape
- Describe threat defense technologies
- Implement a basic security configuration of the device management plane
- Implement basic steps to harden network devices

Audience:

The primary audience for this course is as follows:

- Individuals seeking the Cisco CCNA certification
- Entry-level network engineer
- Network administrator
- Network support technician
- Help desk technician

Prerequisite:

The knowledge and skills that a learner should have before attending this course are as follows:

- Basic computer literacy
- Basic PC operating system navigation skills
- Basic Internet usage skills
- Basic IP address knowledge

Course Outline:

Section 1: Exploring the Functions of Networking

- Identify the components of a computer network and describe their basic characteristics
- Define a network and describe examples of networks 12 Implementing and
- Administering Cisco Solutions (CCNA)
- Components of a Network
- Characteristics of a Network
- Physical vs. Logical Topologies
- Compare and contrast logical and physical topologies
- Interpreting a Network Diagram

- Impact of User Applications on the Network

Section 2: Introducing the Host-To-Host Communications Model

- Host-To-Host Communications Overview
- ISO OSI Reference Model
- TCP/IP Protocol Suite
- Peer-To-Peer Communications
- Encapsulation and De-Encapsulation
- Describe the process of encapsulation and de-encapsulation
- TCP/IP Stack vs OSI Reference Model

Section 3: Operating Cisco IOS Software

- Cisco IOS Software Features and Functions
- Cisco IOS Software CLI Functions
- Cisco IOS Software Modes

Section 4: Introducing LANs

- Local Area Networks
- LAN Components
- Need for Switches
- Characteristics and Features of Switches

Section 5: Exploring the TCP/IP Link Layer

- Ethernet LAN Connection Media
- Ethernet Frame Structure
- Describe the fields of an Ethernet frame
- LAN Communication Types
- MAC Addresses
- Frame Switching
- Duplex Communication

Section 6: Starting a Switch

- Switch Installation
- Connecting to a Console Port
- Switch LED Indicators
- Basic show Commands and Information

Section 7: Introducing the TCP/IP Internet Layer, IPv4 Addressing, and Subnets

- Internet Protocol
- Decimal and Binary Number Systems
- Binary-to-Decimal Conversion
- Decimal-to-Binary Conversion

- IPv4 Address Representation
- IPv4 Header Fields
- IPv4 Address Classes
- Subnet Masks
- Subnets
- Implementing Subnetting: Borrowing Bits
- Implementing Subnetting: Determining the Addressing Scheme
- Benefits of VLSM and Implementing VLSM
- Private vs. Public IPv4 Addresses
- Reserved IPv4 Addresses
- Verifying IPv4 Address of a Host

Section 8: Explaining the TCP/IP Transport Layer and Application Layer

- TCP/IP Transport Layer Functions
- Reliable vs. Best-Effort Transport
- TCP Characteristics
- UDP Characteristics
- TCP/IP Application Layer
- Introducing HTTP
- Domain Name System
- Explaining DHCP for IPv4
- Section 9: Exploring the Functions of Routing
- Role of a Router
- Router Components
- Router Functions
- Routing Table
- Path Determination

Section 10: Configuring a Cisco Router

- Initial Router Setup
- Configuring Router Interfaces
- Configuring IPv4 Addresses on Router Interfaces
- Checking Interface Configuration and Status
- Exploring Connected Devices
- Using Cisco Discovery Protocol
- Configure and Verify LLDP
- Implement an Initial Router Configuration

Section 11: Exploring the Packet Delivery Process

- Layer 2 Addressing
- Layer 3 Addressing
- Default Gateways
- Address Resolution Protocol
- Host-To-Host Packet Delivery

Section 12: Troubleshooting a Simple Network

- Troubleshooting Methods
- Troubleshooting Tools
- Troubleshooting Common Switch Media Issues
- Troubleshooting Common Switch Port Issues
- Identify common access port issues
- Troubleshooting Common Problems Associated with IPv4 Addressing

Section 13: Introducing Basic IPv6

- IPv4 Address Exhaustion Workarounds
- IPv6 Features
- IPv6 Addresses and Address Types
- Comparison of IPv4 and IPv6 Headers
- Internet Control Message Protocol Version 6
- Neighbor Discovery
- IPv6 Address Allocation
- Verification of End-To-End IPv6 Connectivity

Section 14: Configuring Static Routing

- Routing Operation
- When to Use Static Routing
- IPv4 Static Route Configuration
- Default Routes
- Verifying Static and Default Route Configuration
- Configuring IPv6 Static Routes
- Implement IPv4 Static Routing
- Implement IPv6 Static Routing

Section 15: Implementing VLANs and Trunks

- VLAN Introduction
- Creating a VLAN
- Assigning a Port to a VLAN
- Trunking with 802.1Q
- Configuring an 802.1Q Trunk
- VLAN Design Consideration
- Troubleshoot VLANs and Trunk

Section 16: Routing Between VLANs

- Purpose of Inter-VLAN Routing
- Options for Inter-VLAN Routing
- Implement Multiple VLANs and Basic Routing Between the VLANs

Section 17: Introducing OSPF

- Dynamic Routing Protocols
- Path Selection
- Link-State Routing Protocol Overview
- Link-State Routing Protocol Data Structures
- Introducing OSPF
- Establishing OSPF Neighbor Adjacencies
- OSPF Neighbor States
- SPF Algorithm
- Building a Link-State Database
- Routing for IPv6

Section 18: Building Redundant Switched Topologies

- Physical Redundancy in a LAN
- Issues in Redundant Topologies
- Spanning Tree Operation
- Types of Spanning Tree Protocols
- Rapid Spanning Tree Protocol
- PortFast and BPDU Guard

Section 19: Improving Redundant Switched Topologies with EtherChannel

- EtherChannel Overview
- EtherChannel Configuration Options
- Configuring and Verifying EtherChannel
- Improve Redundant Switched Topologies with EtherChannel

Section 20: Exploring Layer 3 Redundancy

- Need for Default Gateway Redundancy
- Understanding FHRP
- Understanding HSRP

Section 21: Introducing WAN Technologies

- Introduction to WAN Technologies
- WAN Devices and Demarcation Point
- WAN Topology Options
- WAN Connectivity Options
- Virtual Private Networks
- Enterprise-Managed VPNs
- Provider-Managed VPNs

Section 22: Explaining Basics of ACL

- ACL Overview
- ACL Operation
- ACL Wildcard Masking

- Wildcard Mask Abbreviations
- Types of Basic ACLs
- Configuring Standard IPv4 ACLs
- Configuring Extended IPv4 ACLs
- Verifying and Modifying IPv4 ACLs
- Applying IPv4 ACLs to Filter Network Traffic
- Implement Numbered and Named IPv4 ACLs

Section 23: Enabling Internet Connectivity

- Configure internet access using DHCP clients and explain and configure NAT on Cisco routers
- Introducing Network Address Translation
- NAT Terminology and Translation Mechanisms
- Benefits and Drawbacks of NAT
- Static NAT and Port Forwarding
- Dynamic NAT
- Port Address Translation
- Configuring and Verifying Inside IPv4 NAT
- Implement PAT

Section 24: Introducing QoS

- Converged Networks
- Quality of Service Defined
- QoS Policy
- QoS Mechanisms
- QoS Models
- Deploying End-to-End QoS

Section 25: Explaining Wireless Fundamentals

- Wireless Technologies
- WLAN Architectures
- WLAN Components
- WiFi Channels
- AP and WLC Management

Section 26: Introducing Architectures and Virtualization

- Introduction to Network Design
- Enterprise Three-Tier Hierarchical Network Design
- Spine-Leaf Network Design
- Cisco Enterprise Architecture Model
- Cloud Computing Overview
- Device Architecture
- Virtualization Fundamentals

Section 27: Explaining the Evolution of Intelligent Networks

- Overview of Network Programmability in Enterprise Networks
- Software-Defined Networking
- Common Programmability Protocols and Methods
- Configuration Management Tools
- Introducing Cisco DNA Center
- Cisco SD-Access
- Introducing Cisco SD-WAN

Section 28: Introducing System Monitoring

- Introducing Syslog
- Syslog Message Format
- SNMP Overview
- Enabling Network Time Protocol
- Configure System Message Logging

Section 29: Managing Cisco Devices

- Cisco IOS Integrated File System and Devices
- Stages of the Router Power-On Boot Sequence
- Loading and Managing System Images Files
- Loading Cisco IOS Configuration Files
- Validating Cisco IOS Images Using MD5
- Managing Cisco IOS Images and Device Configuration Files

Section 30: Examining the Security Threat Landscape

- Security Threat Landscape Overview
- Malware
- Hacking Tools
- Denial of Service and Distributed Denial of Service
- Spoofing
- Reflection and Amplification Attacks
- Social Engineering
- Evolution of Phishing
- Password Attacks
- Reconnaissance Attacks
- Buffer Overflow Attacks
- Man-in-the-Middle Attacks
- Vectors of Data Loss and Exfiltration
- Other Considerations

Section 31: Implementing Threat Defense Technologies

- Information Security Overview
- Firewalls

- Intrusion Prevention Systems
- Introduction to Cryptographic Technologies
- IPsec Security Services
- Secure Sockets Layer and Transport Layer Security
- Wireless Security Protocols
- Configure WPA2 PSK

Section 32: Securing Administrative Access

- Network Device Security Overview
- Securing Access to Privileged EXEC Mode
- Securing Console Access
- Securing Remote Access
- Configuring the Login Banner
- Limiting Remote Access with ACLs
- External Authentication Options
- Secure Device Administrative Access

Section 33: Implementing Device Hardening

- Securing Unused Ports
- Infrastructure ACL
- Disabling Unused Services
- Port Security Overview
- Mitigating VLAN Attacks
- DHCP Snooping
- Dynamic ARP Inspection
- Implement Device Hardening

Lab Outline

- Discovery 1: Get Started with Cisco CLI
- Discovery 2: Observe How a Switch Operates
- Discovery 3: Perform Basic Switch Configuration
- FASTLab 1: Implement the Initial Switch Configuration
- Discovery 4: Inspect TCP/IP Applications
- Discovery 5: Configure an Interface on a Cisco Router
- Discovery 6: Configure and Verify Layer 2 Discovery Protocols
- FASTLab 2: Implement an Initial Router Configuration
- Discovery 7: Configure Default Gateway
- Discovery 8: Explore Packet Forwarding
- Discovery 9: Troubleshoot Switch Media and Port Issues
- Discovery 10: Troubleshoot Port Duplex Issues
- Discovery 11: Configure Basic IPv6 Connectivity
- Discovery 12: Configure and Verify IPv4 Static Routes
- Discovery 13: Configure IPv6 Static Routes
- FASTLab 3: Implement IPv4 Static Routing
- FASTLab 4: Implement IPv6 Static Routing

- Discovery 14: Configure VLAN and Trunk
- FASTLab 5: Troubleshoot VLANs and Trunk
- Discovery 15: Configure a Router on a Stick
- FASTLab 6: Implement Multiple VLANs and Basic Routing Between the VLANs
- Discovery 16: Configure and Verify Single-Area OSPF
- Discovery 17: Configure and Verify EtherChannel
- FASTLab 7: Improve Redundant Switched Topologies with EtherChannel
- Discovery 18: Configure and Verify IPv4 ACLs
- FASTLab 8: Implement Numbered and Named IPv4 ACLs
- Discovery 19: Configure a Provider-Assigned IPv4 Address
- Discovery 20: Configure Static NAT
- Discovery 21: Configure Dynamic NAT and PAT
- FASTLab 9: Implement PAT
- Discovery 22: Log into the WLC
- Discovery 23: Monitor the WLC
- Discovery 24: Configure a Dynamic (VLAN) Interface
- Discovery 25: Configure a DHCP Scope
- Discovery 26: Configure a WLAN
- Discovery 27: Define a RADIUS Server
- Discovery 28: Explore Management Options
- Discovery 29: Explore the Cisco DNA Center
- Discovery 30: Configure and Verify NTP
- FASTLab 10: Configure System Message Logging
- Discovery 31: Create the Cisco IOS Image Backup
- Discovery 32: Upgrade Cisco IOS Image
- Discovery 33: Configure WLAN Using WPA2 PSK Using the GUI
- Discovery 34: Secure Console and Remote Access
- Discovery 35: Enable and Limit Remote Access Connectivity
- FASTLab 11: Secure Device Administrative Access
- Discovery 36: Configure and Verify Port Security
- FASTLab 12: Implement Device Hardening