



## Cisco Implementing and Administering Cisco Solutions v1.0 (CCNA)

### Summary

Length: 40 hours Level: Foundational

This course gives you a broad range of fundamental knowledge for all IT careers. You will learn how to install, operate, configure, and verify a basic IPv4 and IPv6 network. The course covers configuring network components such as switches, routers, and Wireless LAN Controllers; managing network devices; and identifying basic security threats. The course also gives you a foundation in network programmability, automation, and software-defined networking. This course helps you prepare to take the 200-301 Cisco Certified Network Associate (CCNA) exam to earn CCNA certification. This course consists of 5 days of instructor-led training with hands-on lab practice, plus the equivalent of 3 days of self-paced material. This course includes post class lab access- a total of 60 hours of labs

### Learning Objectives

After taking this course, you should be able to:

- 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 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, addresses and configure and verify basic IPv6 connectivity
- Describe the operation, benefits, and limitations of static routing
- Describe, implement and verify 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 OSPF
- Explain how STP and 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 ACLs and their applications in the network
- Configure internet access using DHCP clients and explain and configure NAT on Cisco routers
- Describe the basic QoS concepts
- Describe the concepts of wireless networks, which types of wireless networks can be built and how to use WLC
- Describe network and device architectures and introduce virtualization
- Introduce the concept of network programmability and SDN and describe the smart network management solutions like Cisco DNA Center, SD-Access and 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

### Course Outline

1. Exploring the Functions of Networking

- What is a computer network?
- Components of a network
- Characteristics of a network
- Physical vs. Logical Topologies
- Interpreting a network diagram
- Impact of user applications on the network

## 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
- TCP/IP stack vs OSI reference model

## 3. Operating Cisco IOS Software

- Cisco IOS software features and functions
- Cisco IOS software CLI functions
- Cisco IOS software models
- Discovery 1: Get started with Cisco CLI

## 4. Introducing LANs

- Local area networks
- LAN components
- Need for switches
- Characteristics and features of switches

## 5. Exploring the TCP/IP Link Layer

- Ethernet LAN connection media
- Ethernet frame structure
- LAN communication types
- MAC addresses
- Frame switching
- Discovery 2: Observe how a switch operate
- Duplex communication

## 6. Starting a Switch

- Switch installation
- Connecting to a console port
- Switch LED indicators
- Basic show commands and information
- Discovery 3: Perform basic switch configuration
- Implement the initial switch configuration

## 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

## 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
- Discovery 4: Inspect TCP/IP applications

## 9. Exploring the Functions of Routing

- Role of a router
- Router components
- Router functions
- Routing table
- Path determination

## 10. Configuring a Cisco Router

- Initial router setup
- Configuring router interfaces
- Configuring IPv4 addresses on router interfaces
- Checking interface configuration and status
- Discovery 5: Configure an interface on a Cisco router
- Exploring connected devices
- Using Cisco Discovery Protocol
- Configure and verify LLDP
- Discovery 6: Configure and verify layer 2 discovery protocols
- Implement an initial router configuration

## 11. Exploring the Packet Delivery Process

- Layer 2 addressing
- Layer 3 addressing
- Default gateways
- Address resolution protocol
- Discover 7: Configure default gateway
- Host-to-host packet delivery
- Discovery 8: Explore packet forwarding

## 12. Troubleshooting a Simple Network

- Troubleshooting methods
- Troubleshooting tools
- Troubleshooting common switch media issues
- Troubleshooting common switch port issues
- Discovery 9: Troubleshoot switch media and port issues
- Discovery 10: Troubleshoot port duplex issues
- Troubleshooting common problems associated with IPv4 addressing

## 13. Introducing Basic IPv6

- IPv4 address exhaustion workarounds
- IPv6 features
- IPv6 addresses and address types
- Comparison of IPv4 and IPv6 header
- Internet control message protocol version 6
- Neighbor discovery
- IPv6 address allocation
- Discovery 11: Configure basic IPv6 connectivity
- Verification of end-to-end IPv6 connectivity

#### 14. Configuring Static Routing

- Routing Operation
- Static and dynamic routing comparison
- When to use static routing
- IPv4 static route configuration
- Default routes
- Verifying static and default route configuration
- Discovery 12: Configure and verify IPv4 static routes
- Configuring IPv6 static routes
- Discovery 13: Configure IPv6 static routes
- Implement IPv4 static routing
- Implement IPv6 static routing

#### 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
- Discovery 14: Configure VLAN and trunk
- VLAN design considerations
- Troubleshoot VLANs and trunk

#### 16. Routing Between VLANs

- Purpose of Inter-VLAN routing
- Options for the Inter-VLAN routing
- Discovery 15: Configure a router on a stick
- Implement multiple VLANs and basic routing between the VLANs

#### 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
- Discovery 16: Configure and verify single-area OSPF
- Routing for IPv6

#### 18. Building Redundant Switched Topologies (Self-study)

- Physical redundancy in a LAN
- Issues in redundant topologies
- Spanning tree operation

- Types of spanning tree protocols
- PortFast and BPDU guard
- Rapid spanning tree protocol

#### 19. Improving Redundant Switched Topologies with EtherChannel

- EtherChannel overview
- EtherChannel configuration options
- Configuring and verifying EtherChannel
- Discovery 17: Configure and verify EtherChannel
- Improve redundant switched topologies with EtherChannel

#### 20. Exploring Layer 3 Redundancy (Self-study)

- Need for default gateway redundancy
- Understanding FHRP
- Understanding HSRP

#### 21. Introducing WAN Technologies (Self-study)

- Introduction to WAN technologies
- WAN devices and demarcation point
- WAN topology options
- WAN connectivity options
- Virtual private networks
- Enterprise-managed VPNs
- Provider-managed VPNs

#### 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
- Discovery 18: Configure and verify IPv4 ACLs
- Implement numbered and named IPv4 ACLs

#### 23. Enabling Internet Connectivity

- Discovery 19: Configure a provider-assigned IPv4 address
- 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
- Discovery 20: Configure static NAT
- Discovery 21: Configure dynamic NAT and PAT
- Implement PAT

#### 24. Introducing QoS (Self-study)

- Converged networks
- Quality of service defined
- QoS policy

- QoS mechanisms
- QoS models
- Deploying end-to-end QoS

## 25. Explaining Wireless Fundamentals (Self-study)

- Wireless technologies
- WLAN architectures
- WiFi channels
- AP and WLC management
- 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

## 26. Introducing Architectures and Virtualization (Self-study)

- Introduction to network design
- Enterprise three-tier hierarchical network design
- Spine-leaf network design
- Cisco enterprise architecture model
- Cloud computing overview
- Network device architecture
- Virtualization fundamentals

## 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
- Discovery 29: Explore the Cisco DNA center
- Introducing Cisco SD-Access
- Introducing Cisco SD-WAN

## 28. Introducing System Monitoring

- Introducing Syslog
- Syslog message format
- SNMP overview
- Enabling network time protocol
- Discovery 30: Configure and verify NTP
- Configure system message logging

## 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
- Discovery 31: Create the Cisco IOS image backup
- Discovery 32: Upgrade Cisco IOS image

## 30. Examining the Security Threat Landscape (Self-study)

- 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

### 31. Implementing Threat Defense Technologies (Self-study)

- Information security overview
- Firewalls
- Intrusion prevention systems
- Protection against data loss and phishing attacks
- Defending against DoS and DDoS attacks
- Introduction to cryptographic technologies
- IPsec security services
- Secure sockets Layer and transport layer security
- Wireless security protocols
- Discover 33: Configure WLAN using WPA2 PSK using the GUI

### 32. Securing Administrative Access

- Network device security overview
- Securing access to privileged EXEC mode
- Securing console access
- Securing remote access
- Discover 34: Secure console and remote access
- Configuring the login banner
- Limiting remote access with ACLs
- Discovery 35: Enable and limit remote access connectivity
- External authentication options
- Secure device administrative access

### 33. Implementing Device Hardening

- Securing unused ports
- Infrastructure ACL
- Disabling unused services
- Port security
- Discovery 36: Configure and verify port security
- Mitigating VLAN attacks
- DHCP snooping
- Dynamic ARP inspection
- Mitigation STP attacks
- Implement device hardening

The self-study material can be done at your own pace after the instructor-led portion of the course.

## Audience

This course is designed for anyone seeking CCNA certification. The course also provides foundational knowledge for all support technicians involved in the basic installation, operation, and verification of Cisco networks. The job roles best suited to the material in this course are Entry-level network engineer, Network administrator, Network support technician, or Help desk technician.

## Prerequisites

Before taking this course, you should have: - Basic computer literacy - Basic PC operating system navigation skills - Basic internet usage skills - Basic IP address knowledge