

Cisco Certified Network Associate (CCNA)

Program Summary

This instructor-led program with a combination of lecture and hands-on laboratory exercises validates the ability to install, configure, operate, and troubleshoot medium-size route and switched networks, including implementation and verification of connections to remote sites in a WAN. CCNA curriculum includes basic mitigation of security threats, introduction to wireless networking concepts and terminology, and performance-based skills. This new curriculum also includes (but is not limited to) the use of these protocols: IP, Enhanced Interior Gateway Routing Protocol (EIGRP), Serial Line Interface Protocol Frame Relay, Routing Information Protocol Version 2 (RIPv2), VLANs, Ethernet, access control lists (ACLs).

- Certification program
- 96 Contact Hours, 6 Credit Hours, 12 Weeks

Course No.	Course Name	Quarter Credit Hours	Clock Hours
CCA100	Administration I	6	96
Total		6	96

Prerequisites

Candidates wishing to enter this course should have completed either a Microsoft or Linux+ networking program or have commensurate experience with PC networking and TCP/IP.

Type of Document Received Upon Graduation

Upon successful completion of all program requirements, each student will be awarded a Certificate of Completion.

Certification Tests

All certification exams are scored on a pass/fail basis. Depending on the specific exam, a correct response to 75% - 80% of the questions will be required to achieve a passing score. Students are encouraged to take exams immediately following completion of the corresponding course.

Career Development

Students who successfully complete this program will be prepared for entry to midlevel professional opportunities in the IT field with emphasis on installation, configuration and maintenance of Local Area Network (LAN) infrastructure. Although titles may vary by hiring organizations, students with these credentials are qualified to meet the requirements of positions such as Network Engineer, Network Support Specialist, Local Area Network Engineer, Network Systems Engineer or similar designations.

This program also aligns with the following career opportunities classified by US Department of Labor under the Standard Occupational Classification (SOC) system.

- 15-1142 Network and Computer System Administrators
- 15-1152 Computer Network Support Specialist

Recommended Next Course

Candidates wishing to further their education are recommended to consider the Cisco Certified Network Professional (CCNP) program as the next logical step towards becoming a well rounded IT professional.

CCNA Program Details

COURSE CCA100

Title: Cisco Certified Network Associate

Exam: 200-301

Course Description

This instructor-led program with a combination of lecture and hands-on laboratory exercises covers basic networking concepts implemented on Cisco routers. Students will be introduced to the Cisco Internetworking Operating System (IOS) and its command structure. TCP/IP addressing and implementation, including subnetting, will be covered thoroughly. Wide Area Networking (WAN) implementations including ISDN, frame relay, and serial point-to-point (including T1), will be emphasized. This is an advanced course providing the skills and knowledge necessary to pass the Cisco certification exam (one exam) necessary to become a Cisco Certified Network Associate (CCNA).

Course Objectives

This course will cover the following subjects:

Part I - Introduction to Networking

Introduction to TCP/IP Networking

- Foundation Topics
- Perspectives on Networking
- TCP/IP Networking Model
- History Leading to TCP/IP
- Overview of the TCP/IP Networking Model
- TCP/IP Application Layer
- TCP/IP Transport Layer
- TCP/IP Network Layer
- TCP/IP Data-Link and Physical Layers
- Data Encapsulation Terminology
- Names of TCP/IP Messages
- OSI Networking Model and Terminology

Fundamentals of Ethernet LANs

- Foundation Topics
- An Overview of LANs
- Typical SOHO LANs
- Typical Enterprise LANs
- The Variety of Ethernet Physical Layer Standards
- Consistent Behavior over All Links Using the Ethernet Data-Link Layer
- Building Physical Ethernet LANs with UTP
- Transmitting Data Using Twisted Pairs
- Breaking Down a UTP Ethernet Link
- UTP Cabling Pinouts for 10BASE-T and 100BASE-T
- UTP Cabling Pinouts for 1000BASE-T
- Building Physical Ethernet LANs with Fiber
- Fiber Cabling Transmission Concepts
- Using Fiber with Ethernet
- Sending Data in Ethernet Networks
- Ethernet Data-Link Protocols
- Sending Ethernet Frames with Switches and Hubs

Fundamentals of WANs and IP Routing

- Foundation Topics
- Wide-Area Networks
- Leased-Line WANs
- Ethernet as a WAN Technology
- IP Routing
- Network Layer Routing (Forwarding) Logic
- How Network Layer Routing Uses LANs and WANs
- How IP Addressing Helps IP Routing
- How IP Routing Protocols Help IP Routing
- Other Network Layer Features
- Using Names and the Domain Name System
- The Address Resolution Protocol
- ICMP Echo and the ping Command

Part II - Implementing Ethernet LANs

Using the Command-Line Interface

- Foundation Topics
- Accessing the Cisco Catalyst Switch CLI
- Cisco Catalyst Switches
- Accessing the Cisco IOS CLI
- 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

Analyzing Ethernet LAN Switching

- Foundation Topics
- LAN Switching Concepts
- Overview of Switching Logic
- Forwarding Known Unicast Frames
- Learning MAC Addresses
- Flooding Unknown Unicast and Broadcast Frames
- Avoiding Loops Using Spanning Tree Protocol
- LAN Switching Summary
- Verifying and Analyzing Ethernet Switching
- Demonstrating MAC Learning
- Switch Interfaces
- Finding Entries in the MAC Address Table
- Managing the MAC Address Table (Aging, Clearing)
- MAC Address Tables with Multiple Switches

Configuring Basic Switch Management

- Foundation Topics
- Securing the Switch CLI
- Securing User Mode and Privileged Mode with Simple Passwords
- Securing User Mode Access with Local Usernames and Passwords
- Securing User Mode Access with External Authentication Servers
- Securing Remote Access with Secure Shell
- Enabling IPv4 for Remote Access
- Host and Switch IP Settings
- Configuring IPv4 on a Switch
- Configuring a Switch to Learn Its IP Address with DHCP
- Verifying IPv4 on a Switch
- Miscellaneous Settings Useful in the Lab
- History Buffer Commands
- The logging synchronous, exec-timeout, and no ip domain-lookup Commands

Configuring and Verifying Switch Interfaces

- Foundation Topics
- Configuring Switch Interfaces
- Configuring Speed, Duplex, and Description
- Configuring Multiple Interfaces with the interface range Command
- Administratively Controlling Interface State with shutdown
- Removing Configuration with the no Command
- Autonegotiation
- Analyzing Switch Interface Status and Statistics
- Interface Status Codes and Reasons for Nonworking States
- Interface Speed and Duplex Issues
- Common Layer 1 Problems on Working Interfaces

Part III - Implementing VLANs and STP

Implementing Ethernet Virtual LANs

- Foundation Topics
- Virtual LAN Concepts
- Creating Multiswitch VLANs Using Trunking
- Forwarding Data Between VLANs
- VLAN and VLAN Trunking Configuration and Verification
- Creating VLANs and Assigning Access VLANs to an Interface
- VLAN Trunking Protocol
- VLAN Trunking Configuration
- Implementing Interfaces Connected to Phones
- Troubleshooting VLANs and VLAN Trunks
- Access VLANs Undefined or Disabled
- Mismatched Trunking Operational States
- The Supported VLAN List on Trunks
- Mismatched Native VLAN on a Trunk

Spanning Tree Protocol Concepts

- Foundation Topics
- STP and RSTP Basics
- The Need for Spanning Tree
- What Spanning Tree Does
- How Spanning Tree Works
- Configuring to Influence the STP Topology
- Details Specific to STP (and Not RSTP)
- STP Activity When the Network Remains Stable
- STP Timers That Manage STP Convergence
- Changing Interface States with STP
- Rapid STP Concepts
- Comparing STP and RSTP
- RSTP and the Alternate (Root) Port Role
- RSTP States and Processes
- RSTP and the Backup (Designated) Port Role
- RSTP Port Types
- Optional STP Features

RSTP and EtherChannel Configuration

- Foundation Topics
- Understanding RSTP Through Configuration
- The Need for Multiple Spanning Trees
- STP Modes and Standards
- The Bridge ID and System ID Extension
- How Switches Use the Priority and System ID Extension
- RSTP Methods to Support Multiple Spanning Trees
- Other RSTP Configuration Options
- Configuring Layer 2 EtherChannel
- Configuring a Manual Layer 2 EtherChannel
- Configuring Dynamic EtherChannels
- Physical Interface Configuration and EtherChannels
- EtherChannel Load Distribution

Part IV - IPv4 Addressing

Perspectives on IPv4 Subnetting

- Foundation Topics
- Introduction to Subnetting
- Subnetting Defined Through a Simple Example
- Operational View V.s. Design View of Subnetting
- Analyze Subnetting and Addressing Needs
- Rules about Which Hosts Are in Which Subnet
- Determining the Number of Subnets
- Determining the Number of Hosts per Subnet
- One Size Subnet Fits All—Or Not
- Make Design Choices
- Choose a Classful Network
- Choose the Mask
- Build a List of All Subnets
- Plan the Implementation
- Assigning Subnets to Different Locations

- *Choose Static and Dynamic Ranges per Subnet*

Analyzing Classful IPv4 Networks

- Foundation Topics
- Classful Network Concepts
- IPv4 Network Classes and Related Facts
- Number of Hosts per Network
- Deriving the Network ID and Related Numbers
- Unusual Network IDs and Network Broadcast Addresses
- Practice with Classful Networks
- Practice Deriving Key Facts Based on an IP Address
- Practice Remembering the Details of Address Classes

Analyzing Subnet Masks

- Foundation Topics
- Subnet Mask Conversion
- Three Mask Formats
- Converting Between Binary and Prefix Masks
- Converting Between Binary and DDN Masks
- Converting Between Prefix and DDN Masks
- Practice Converting Subnet Masks
- Identifying Subnet Design Choices Using Masks
- Masks Divide the Subnet's Addresses into Two Parts
- Masks and Class Divide Addresses into Three Parts
- Classless and Classful Addressing
- Calculations Based on the IPv4 Address Format
- Practice Analyzing Subnet Masks

Analyzing Existing Subnets

- Foundation Topics
- Defining a Subnet
- An Example with Network 172.16.0.0 and Four Subnets
- Subnet ID Concepts
- Subnet Broadcast Address
- Range of Usable Addresses
- Analyzing Existing Subnets: Binary
- Finding the Subnet ID: Binary
- Finding the Subnet Broadcast Address: Binary
- Binary Practice Problems
- Shortcut for the Binary Process
- Brief Note about Boolean Math
- Finding the Range of Addresses
- Analyzing Existing Subnets: Decimal
- Analysis with Easy Masks
- Predictability in the Interesting Octet
- Finding the Subnet ID: Difficult Masks
- Finding the Subnet Broadcast Address: Difficult Masks
- Practice Analyzing Existing Subnets
- A Choice: Memorize or Calculate

Part V - IPv4 Routing

Operating Cisco Routers

- Foundation Topics
- Installing Cisco Routers
- Installing Enterprise Routers
- Installing SOHO Routers
- Enabling IPv4 Support on Cisco Router Interfaces
- Accessing the Router CLI
- Router Interfaces
- Router Auxiliary Port

Configuring IPv4 Addresses and Static Routes

- Foundation Topics
- IP Routing
- IPv4 Routing Process Reference
- An Example of IP Routing
- Configuring IP Addresses and Connected Routes
- Connected Routes and the ip address Command
- The ARP Table on a Cisco Router
- Configuring Static Routes
- Static Network Routes
- Static Host Routes
- Floating Static Routes
- Static Default Routes
- Troubleshooting Static Routes
- IP Forwarding with the Longest Prefix Match
- Using show ip route to Find the Best Route
- Using show ip route address to Find the Best Route
- Interpreting the IP Routing Table

IP Routing in the LAN

- Foundation Topics
- VLAN Routing with Router 802.1Q Trunks
- Configuring ROAS
- Verifying ROAS
- Troubleshooting ROAS
- VLAN Routing with Layer 3 Switch SVIs
- Configuring Routing Using Switch SVIs
- Verifying Routing with SVIs
- Troubleshooting Routing with SVIs
- VLAN Routing with Layer 3 Switch Routed Ports
- Implementing Routed Interfaces on Switches
- Implementing Layer 3 EtherChannels
- Troubleshooting Layer 3 EtherChannels

Troubleshooting IPv4 Routing

- Foundation Topics
- Problem Isolation Using the ping Command
- Ping Command Basics
- Strategies and Results When Testing with the ping Command
- Using Ping with Names and with IP Addresses
- Problem Isolation Using the traceroute Command

- traceroute Basics
- Telnet and SSH
- Common Reasons to Use the IOS Telnet and SSH Client
- IOS Telnet and SSH Examples

Part VI - OSPF

Understanding OSPF Concepts

- Foundation Topics
- Comparing Dynamic Routing Protocol Features
- Routing Protocol Functions
- Interior and Exterior Routing Protocols
- Comparing IGPs
- Administrative Distance
- OSPF Concepts and Operation
- OSPF Overview
- Becoming OSPF Neighbors
- Exchanging the LSDB between Neighbors
- Calculating the Best Routes with SPF
- OSPF Areas and LSAs
- OSPF Areas
- How Areas Reduce SPF Calculation Time

Implementing OSPF

- Foundation Topics
- Implementing Single-Area OSPFv2
- OSPF Single-Area Configuration
- Wildcard Matching with the network Command
- Verifying OSPF Operation
- Verifying OSPF Configuration
- Configuring the OSPF Router ID
- Implementing Multiarea OSPF
- Using OSPFv2 Interface Subcommands
- OSPF Interface Configuration Example
- Additional OSPFv2 Features
- OSPF Passive Interfaces
- OSPF Default Routes
- OSPF Metrics (Cost)
- OSPF Load Balancing

OSPF Network Types and Neighbors

- Foundation Topics
- OSPF Network Types
- The OSPF Broadcast Network Type
- The OSPF Point-to-Point Network Type
- OSPF Neighbor Relationships
- OSPF Neighbor Requirements
- Issues That Prevent Neighbor Adjacencies
- Issues That Allow Adjacencies but Prevent IP Routes

Part VII - IP Version 6

Fundamentals of IP Version 6

- Foundation Topics
- Introduction to IPv6
- The Historical Reasons for IPv6
- The IPv6 Protocols
- IPv6 Routing
- IPv6 Routing Protocols
- IPv6 Addressing Formats and Conventions
- Representing Full (Unabbreviated) IPv6 Addresses
- Abbreviating and Expanding IPv6 Addresses
- Representing the Prefix Length of an Address
- Calculating the IPv6 Prefix (Subnet ID)
- Finding the IPv6 Prefix
- Working with More-Difficult IPv6 Prefix Lengths

IPv6 Addressing and Subnetting

- Foundation Topics
- Global Unicast Addressing Concepts
- Public and Private IPv6 Addresses
- The IPv6 Global Routing Prefix
- Address Ranges for Global Unicast Addresses
- IPv6 Subnetting Using Global Unicast Addresses
- Assigning Addresses to Hosts in a Subnet
- Unique Local Unicast Addresses
- Subnetting with Unique Local IPv6 Addresses
- The Need for Globally Unique Local Addresses

Implementing IPv6 Addressing on Routers

- Foundation Topics
- Implementing Unicast IPv6 Addresses on Routers
- Static Unicast Address Configuration
- Dynamic Unicast Address Configuration
- Special Addresses Used by Routers
- Link-Local Addresses
- IPv6 Multicast Addresses
- Miscellaneous IPv6 Addresses
- Anycast Addresses
- IPv6 Addressing Configuration Summary

Implementing IPv6 Routing

- Foundation Topics
- Connected and Local IPv6 Routes
- Rules for Connected and Local Routes
- Example of Connected IPv6 Routes
- Examples of Local IPv6 Routes
- Static IPv6 Routes
- Static Routes Using the Outgoing Interface
- Static Routes Using Next-Hop IPv6 Address
- Static Default Routes
- Static IPv6 Host Routes
- Floating Static IPv6 Routes

- Troubleshooting Static IPv6 Routes
- The Neighbor Discovery Protocol
- Discovering Neighbor Link Addresses with NDP NS and NA
- Discovering Routers with NDP RS and RA
- Using SLAAC with NDP RS and RA
- Discovering Duplicate Addresses Using NDP NS and NA
- NDP Summary

Part VIII - Wireless LANs

Fundamentals of Wireless Networks

- Foundation Topics
- Comparing Wired and Wireless Networks
- Wireless LAN Topologies
- Basic Service Set
- Distribution System
- Extended Service Set
- Independent Basic Service Set
- Other Wireless Topologies
- Repeater
- Workgroup Bridge
- Outdoor Bridge
- Mesh Network
- RF Overview
- Wireless Bands and Channels
- APs and Wireless Standards

Analyzing Cisco Wireless Architectures

- Foundation Topics
- Autonomous AP Architecture
- Cloud-based AP Architecture
- Split-MAC Architectures
- Comparing Wireless LAN Controller Deployments
- Cisco AP Modes

Securing Wireless Networks

- Foundation Topics
- Anatomy of a Secure Connection
- Authentication
- Message Privacy
- Message Integrity
- Wireless Client Authentication Methods
- Open Authentication
- WEP
- 802.1x/EAP
- Wireless Privacy and Integrity Methods
- TKIP
- CCMP
- GCMP
- WPA, WPA2, and WPA3

Building a Wireless LAN

- Foundation Topics
- Connecting a Cisco AP
- Accessing a Cisco WLC
- Connecting a Cisco WLC
- Using WLC Ports
- Using WLC Interfaces
- Configuring a WLAN:
- Configuring WLAN Security
- Configuring WLAN QoS
- Configuring Advanced WLAN Settings
- Finalizing WLAN Configuration