

# CCNAv7.02

## Introduction to Networks (ITN) Scope and Sequence

Last Updated February 2, 2021

### Target Audience

The Cisco Networking Academy® CCNAv7.02 curriculum is designed for participants who are seeking entry-level jobs in the ICT industry or hope to fulfill prerequisites to pursue more specialized ICT skills. The CCNAv7.02 curriculum is presented in three courses: Introduction to Networks (ITN), Switching, Routing and Wireless Essentials (SRWE), and Enterprise Networking, Security, and Automation (ENSA). These three courses provide integrated and comprehensive coverage of networking topics including: IP routing and switching fundamentals, network security and services, and network programmability and automation, while providing learners extensive opportunities for hands-on practical experience and career skills development.

The entire curriculum is appropriate for learners at many education levels and types of institutions, including high schools, secondary schools, universities, colleges, career and technical schools, and community centers.

### Prerequisites

There are no prerequisites for this offering. Learners are expected to have the following skills:

- High school reading level
- Basic computer literacy
- Basic PC operating system navigation skills
- Basic internet usage skills

### CCNAv7.02 Curriculum Description

In this curriculum, Cisco Networking Academy™ participants develop workforce readiness skills and build a foundation for success in networking-related careers and degree programs. With the support of video and rich interactive media, participants learn, apply, and practice CCNA knowledge and skills through a series of in-depth hands-on experiences and simulated activities that reinforce their learning. Upon completion of all three course offerings, learners will be prepared to take the Cisco CCNA Unified certification exam.

CCNAv7.02 teaches comprehensive networking concepts and skills, from network applications to the protocols and services provided to those applications. Learners will progress from basic networking to more complex enterprise and theoretical networking models later in the curriculum.

CCNAv7.02 includes the following features:

- There are three offerings that make up the CCNAv7.02 curriculum.
- The three offerings align to and cover the competencies outlined for the CCNA Certification Exam.
- Each offering is comprised of multiple modules. Each module is comprised of topics.
- Modules emphasize critical thinking, problem solving, collaboration, and the practical application of skills.

- Each topic contains a Check Your Understanding interactive quiz, or some other way to assess understanding, such as a lab or a Packet Tracer. These topic-level assessments are designed to tell learners if they have a good grasp of the topic content, or if they need to review before continuing. Learners can ensure their level of understanding well before taking a graded quiz or exam. Check Your Understanding quizzes do not affect the learner's overall grade.
- Students learn the basics of routing, switching, and advanced technologies to prepare for the Cisco CCNA exam, networking-related degree programs, and entry-level networking careers.
- The language used to describe networking concepts is designed to be easily understood by learners at all levels and embedded interactive activities help reinforce comprehension.
- Assessments and practice activities are focused on specific competencies to increase retention and provide flexibility in the learning path.
- Multimedia learning tools, including videos, games, and quizzes, address a variety of learning styles and help stimulate learning and promote increased knowledge retention.
- Hands-on labs and Cisco® Packet Tracer simulation-based learning activities help students develop critical thinking and complex problem-solving skills. When access to equipment is limited or not possible, a corresponding Packet Tracer Physical Mode (PTPM) activity is provided to emulate the physical, in-person lab experience.
- PTPM scenarios provide additional opportunities to explore the end-to-end physical connections of simple and globally distributed networks.
- Embedded assessments provide immediate feedback to support the evaluation of knowledge and acquired skills.
- Cisco Packet Tracer activities are designed for use with the latest version of Packet Tracer.

## Lab Equipment Requirements

Networking Academy CCNA courses can be delivered in person or remotely. Hands-on experiences with physical equipment continue to remain an essential best practice, and Networking Academy has no plan to remove this requirement. Academies need to continue providing access to physical equipment as soon as circumstances allow it. However, to support distance learning, lab activities now provide the option to practice skills with PTPM or with lab equipment, if available. Packet Tracer 8.0 provides support for students to practice critical skills normally presented in the physical, in-person lab experience. Networking Academy offers this option as a way to offset the skills gap created by the absence of physical equipment and continue on the path toward student mastery.

Packet Tracer 8.0, 64-bit versions are required for the optimal experience with CCNA 7.PTPM activities and scenarios. Due to the extensive set of graphics included in the PTPM scenarios, these activities may experience performance issues or crashes in Packet Tracer 8.0, 32-bit version. All other PTPM activities should perform as normal.

Current designs for lab topologies leverage equipment used in CCNAv6 and include options to utilize a 2 router + 2 switch + 1 wireless router physical equipment bundle described below. Labs with more complex topologies will rely on PT as a complementary environment to be used in addition to the physical labs. Detailed equipment information, including descriptions and part numbers for the equipment used in CCNAv6 is available in the CCNA Equipment List, which is located on the Cisco NetAcad [Equipment Information](https://www.netacad.com/portal/resources/equipment-information) site (<https://www.netacad.com/portal/resources/equipment-information>).

**Baseline Equipment Bundle:**

- 2 x ISR4221/K9 Routers
- 2 x WS-C2960+24TC-L Catalyst switches
- 1 wireless router (generic brand) with WPA2 support
- Ethernet patch cables
- PCs - minimum system requirements
  - CPU: Intel Pentium 4, 2.53 GHz or equivalent
  - OS: Microsoft Windows 7, Microsoft Windows 8.1, Microsoft Windows 10, Ubuntu 14.04 LTS, macOS High Sierra and Mojave
  - RAM: 4 GB
  - Storage: 500 MB of free disk space
  - Display resolution: 1024 x 768
  - Language fonts supporting Unicode encoding (if viewing in languages other than English)
  - Latest video card drivers and operating system updates
- Internet connection for lab and study PCs
- Optional equipment for connecting to a WLAN
  - 1 printer or integrated printer/scanner/copier for the class to share
  - Smartphones and tablets are desirable for use with the labs

**Software:**

- Cisco IOS versions:
  - Routers: Version 15.0 or higher, IP Base feature set
  - Switches: Version 15.0 or higher, lanbaseK9 feature set
- Packet Tracer 8.0
- Open-source server software:
  - For various services and protocols, such as Telnet, SSH, HTTP, DHCP, FTP, TFTP, etc.
- Tera Term source SSH client software for lab PCs.
- Oracle VirtualBox, most recent version.
- Wireshark version 2.5 or higher.

## CCNAv7.02: Introduction to Networks (ITN) Outline

The first course in the CCNA curriculum introduces the architectures, models, protocols, and networking elements that connect users, devices, applications and data through the internet and across modern computer networks - including IP addressing and Ethernet fundamentals. By the end of the course, students can build simple local area networks (LANs) that integrate IP addressing schemes, foundational network security, and perform basic configurations for routers and switches.

Listed below are the current set of modules and their associated competencies outlined for this course. Each module is an integrated unit of learning that consists of content, activities and assessments that target a specific set

of competencies. The size of the module will depend on the depth of knowledge and skill needed to master the competency. Some modules are considered foundational, in that the artifacts presented, while not assessed, enable learning of concepts that are covered on the CCNA certification exam.

CCNAv7.02: ITN		
Module	Topic	Objective
Networking Today		Explain the advances in modern network technologies.
	Networks Affect Our Lives	Explain how networks affect our daily lives.
	Network Components	Explain how host and network devices are used.
	Network Representations and Topologies	Explain network representations and how they are used in network topologies.
	Common Types of Networks	Compare the characteristics of common types of networks.
	Internet Connections	Explain how LANs and WANs interconnect to the internet.
	Reliable Networks	Describe the four basic requirements of a reliable network.
	Network Trends	Explain how trends such as BYOD, online collaboration, video, and cloud computing are changing the way we interact.
	Network Security	Identify some basic security threats and solutions for all networks.
	The IT Professional	Explain employment opportunities in the networking field.
Module	Topic	Objective
Basic Switch and End Device Configuration		Implement initial settings including passwords, IP addressing, and default gateway parameters on a network switch and end devices.
	Cisco IOS Access	Explain how to access a Cisco IOS device for configuration purposes.
	IOS Navigation	Explain how to navigate Cisco IOS to configure network devices.
	The Command Structure	Describe the command structure of Cisco IOS software.
	Basic Device Configuration	Configure a Cisco IOS device using CLI.
	Save Configurations	Use IOS commands to save the running configuration.
	Ports and Addresses	Explain how devices communicate across network media.

	Configure IP Addressing	Configure a host device with an IP address.
	Verify Connectivity	Verify connectivity between two end devices.
Module	Topic	Objective
Protocols and Models		Explain how network protocols enable devices to access local and remote network resources.
	The Rules	Describe the types of rules that are necessary to successfully communicate.
	Protocols	Explain why protocols are necessary in network communication.
	Protocol Suites	Explain the purpose of adhering to a protocol suite.
	Standards Organizations	Explain the role of standards organizations in establishing protocols for network interoperability.
	Reference Models	Explain how the TCP/IP model and the OSI model are used to facilitate standardization in the communication process.
	Data Encapsulation	Explain how data encapsulation allows data to be transported across the network.
	Data Access	Explain how local hosts access local resources on a network.
Module	Topic	Objective
Physical Layer		Explain how physical layer protocols, services, and network media support communications across data networks.
	Purpose of the Physical Layer	Describe the purpose and functions of the physical layer in the network.
	Physical Layer Characteristics	Describe characteristics of the physical layer.
	Copper Cabling	Identify the basic characteristics of copper cabling.
	UTP Cabling	Explain how UTP cable is used in Ethernet networks.
	Fiber-Optic Cabling	Describe fiber-optic cabling and its main advantages over other media.
	Wireless Media	Connect devices using wired and wireless media.
Module	Topic	Objective
Number Systems		Calculate numbers between decimal, binary, and hexadecimal systems.
	Binary Number System	Calculate numbers between decimal and binary systems.

	Hexadecimal Number System	Calculate numbers between decimal and hexadecimal systems.
<b>Module</b>	<b>Topic</b>	<b>Objective</b>
Data Link Layer		Explain how media access control in the data link layer supports communication across networks.
	Purpose of the Data Link Layer	Describe the purpose and function of the data link layer in preparing communication for transmission on specific media.
	Topologies	Compare the characteristics of media access control methods on WAN and LAN topologies.
	Data Link Frame	Describe the characteristics and functions of the data link frame.
<b>Module</b>	<b>Topic</b>	<b>Objective</b>
Ethernet Switching		Explain how Ethernet operates in a switched network.
	Ethernet Frame	Explain how the Ethernet sublayers are related to the frame fields.
	Ethernet MAC Address	Describe the Ethernet MAC address.
	The MAC Address Table	Explain how a switch builds its MAC address table and forwards frames.
	Switch Speeds and Forwarding Methods	Describe switch forwarding methods and port settings available on Layer 2 switch ports.
<b>Module</b>	<b>Topic</b>	<b>Objective</b>
Network Layer		Explain how routers use network layer protocols and services to enable end-to-end connectivity.
	Network Layer Characteristics	Explain how the network layer uses IP protocols for reliable communications.
	IPv4 Packet	Explain the role of the major header fields in the IPv4 packet.
	IPv6 Packet	Explain the role of the major header fields in the IPv6 packet.
	How a Host Routes	Explain how network devices use routing tables to direct packets to a destination network.
	Router Routing Tables	Explain the function of fields in the routing table of a router.
<b>Module</b>	<b>Topic</b>	<b>Objective</b>

Address Resolution		Explain how ARP and ND enable communication on a network.
	MAC and IP	Compare the roles of the MAC address and the IP address.
	ARP	Describe the purpose of ARP.
	Neighbor Discovery	Describe the operation of IPv6 neighbor discovery.
<b>Module</b>	<b>Topic</b>	<b>Objective</b>
Basic Router Configuration		Implement initial settings on a router and end devices.
	Configure Initial Router Settings	Configure initial settings on a Cisco IOS router.
	Configure Interfaces	Configure two active interfaces on a Cisco IOS router.
	Configure the Default Gateway	Configure devices to use the default gateway.
<b>Module</b>	<b>Topic</b>	<b>Objective</b>
IPv4 Addressing		Calculate an IPv4 subnetting scheme to efficiently segment a network.
	IPv4 Address Structure	Describe the structure of an IPv4 address including the network portion, the host portion, and the subnet mask.
	IPv4 Unicast, Broadcast, and Multicast	Compare the characteristics and uses of the unicast, broadcast and multicast IPv4 addresses.
	Types of IPv4 Addresses	Explain public, private, and reserved IPv4 addresses.
	Network Segmentation	Explain how subnetting segments a network to enable better communication.
	Subnet an IPv4 Network	Calculate IPv4 subnets for a /24 prefix.
	Subnet a /16 and /8 Prefix	Calculate IPv4 subnets for a /16 and /8 prefix.
	Subnet to Meet Requirements	Given a set of requirements for subnetting, implement an IPv4 addressing scheme.
	Variable Length Subnet Masking	Explain how to create a flexible addressing scheme using variable length subnet masking (VLSM).
	Structured Design	Implement a VLSM addressing scheme.
<b>Module</b>	<b>Topic</b>	<b>Objective</b>
IPv6 Addressing		Implement an IPv6 addressing scheme.
	IPv4 Issues	Explain the need for IPv6 addressing.
	IPv6 Addressing	Explain how IPv6 addresses are represented.

	IPv6 Address Types	Compare types of IPv6 network addresses.
	GUA and LLA Static Configuration	Explain how to configure static global unicast and link-local IPv6 network addresses.
	Dynamic Addressing for IPv6 GUAs	Explain how to configure global unicast addresses dynamically.
	Dynamic Addressing for IPv6 LLAs	Configure link-local addresses dynamically.
	IPv6 Multicast Addresses	Identify IPv6 addresses.
	Subnet an IPv6 Network	Implement a subnetted IPv6 addressing scheme.
Module	Topic	Objective
ICMP		Use various tools to test network connectivity.
	ICMP Messages	Explain how ICMP is used to test network connectivity.
	Ping and Traceroute Testing	Use ping and traceroute utilities to test network connectivity.
Module	Topic	Objective
Transport Layer		Compare the operations of transport layer protocols in supporting end-to-end communication.
	Transportation of Data	Explain the purpose of the transport layer in managing the transportation of data in end-to-end communication.
	TCP Overview	Explain characteristics of the TCP.
	UDP Overview	Explain characteristics of the UDP.
	Port Numbers	Explain how TCP and UDP use port numbers.
	TCP Communication Process	Explain how TCP session establishment and termination processes facilitate reliable communication.
	Reliability and Flow Control	Explain how TCP protocol data units are transmitted and acknowledged to guarantee delivery.
	UDP Communication	Describe the UDP client processes to establish communication with a server.
Module	Topic	Objective
Application Layer		Explain the operation of application layer protocols in providing support to end-user applications.
	Application, Presentation, and Session	Explain how the functions of the application layer, session layer, and presentation layer work together to provide network services to end user applications.



	Peer-to-Peer	Explain how end user applications operate in a peer-to-peer network.
	Web and Email Protocols	Explain how web and email protocols operate.
	IP Addressing Services	Explain how DNS and DHCP operate.
	File Sharing Services	Explain how file transfer protocols operate.
Module	Topic	Objective
Network Security Fundamentals		Configure switches and routers with device hardening features to enhance security.
	Security Threats and Vulnerabilities	Explain why basic security measures are necessary on network devices.
	Network Attacks	Identify security vulnerabilities.
	Network Attack Mitigation	Identify general mitigation techniques.
	Device Security	Configure network devices with device hardening features to mitigate security threats.
Module	Topic	Objective
Build a Small Network		Implement a network design for a small network to include a router, a switch, and end devices.
	Devices in a Small Network	Identify the devices used in a small network.
	Small Network Applications and Protocols	Identify the protocols and applications used in a small network.
	Scale to Larger Networks	Explain how a small network serves as the basis of larger networks.
	Verify Connectivity	Use the output of the ping and tracert commands to verify connectivity and establish relative network performance.
	Host and IOS Commands	Use host and IOS commands to acquire information about the devices in a network.
	Troubleshooting Methodologies	Describe common network troubleshooting methodologies.
	Troubleshooting Scenarios	Troubleshoot issues with devices in the network.