CCNA1: Introduction to Networks

**Description:**

CCNA1: *Introduction to Networks* for cable business and networking professionals is the first of two courses that may be used to prepare for the Cisco Certified Entry Level Technician (CCENT), and the first of four courses that may be used to prepare for the Cisco Certified Network Associate (CCNA) exam.

CCNA1 introduces SCTE/IBSE learners to fundamental networking concepts and technologies using a hands-on approach. Programming, cabling and installing routers, L2/L3 switches, IP configuration and other network equipment, with an emphasis on cable operator operations. In addition, the course will assist the learner in developing the skills necessary to plan and implement small networks across a range of applications. An advanced understanding of TCP/IP, architectures, topologies, OSI model layers and network designs will be taught in the course. SCTE/ISBE courses emphasize critical thinking, problem solving, collaboration, and the practical application of skills.

By the end of this course, the learner will be able to build LANs, perform configurations for routers and switches, and implement IP addressing schemes in both IPv4 and IPv6.

[Download Course Description (PDF)]

**Format: Online, Self-Paced Scheduled:**

This course is expected to take 12 weeks to complete online, 5 days onsite for a total of 40 hours. Learners view online interactive materials and complete learning activities at a time that is convenient for the learner. Scheduled virtual online instructor coaching sessions will be optional, but participation is strongly suggested by SCTE/ISBE to provide direct interaction with the certified instructor. However, if the learner is unable to attend, these sessions are recorded. The coaching session times are determined by the students and instructor during the orientation that is held on the first day of the course. Learners spend approximately 6-8 hours per week completing the various course activities.

Access information will be emailed when the course is purchased.

**System Requirements:**

- High speed Internet (HSD) connection
- Updated Internet Browser (Chrome, Firefox, Safari or Internet Explorer)
  - HTML 5 Support
**Target Audience:**
A cable professional who desires a practical and technical introduction to the field of networking. This includes field technicians, business service technicians, headend technicians, network operations center (NOC) staff, network engineers, network administrators, and IT help-desk staff.

**Prerequisites:**
Basic computer literacy and awareness of the Internet
NOTE: a student can ONLY sign up for one CCNA course at a time

**Course Materials:**
Interactive and engaging SCTE/ISBE and Cisco Network Academy course content that includes chapter assessments, learning activities, practice exams and a course final confirmation of learning, along with a requirement to complete a number of hands-on labs using a lab simulator.

**Course Objectives:**
*Upon completion of this course, students will:*
- Understand and be able to describe the devices and services used to support communications in cable networks, which inevitably connect to the Internet
- Understand and describe the role of protocol layers in cable networks
- Understand and describe the importance of addressing and naming schemes at various layers of data networks in IPv4 and IPv6 environments
- Design, calculate, and apply subnet masks and addresses to fulfill given requirements in IPv4 and IPv6 networks
- Explain fundamental Ethernet concepts, such as media, services, and operations
- Program a command-line interface (CLI) to perform router and switch configurations using simulation-based learning activities and real equipment located in SCTE/ISBE’s routing & switching lab
- Operate an internetworking operating system (IOS) using simulation-based learning activities and real equipment located in SCTE/ISBE’s routing & switching lab
- Utilize common network utilities to verify network operations and analyze data traffic
- Explore troubleshooting methods such as; ping, traceroute, extended ping & traceroute and introduction into IOS debugging
Course Modules:

1. Explore the Network
2. Configuring a Network Operating System
3. Network Protocols and Communications
4. Network Access
5. Ethernet
6. Network Layer
7. IP Addressing
8. Subnetting IP Networks
9. Transport Layer
10. Application Layer
11. Build a Small Network

Course Outline:

Chapter 1: Explore the Network
- Explain how networks affect the way we interact, learn, work, and play.
- Explain how host devices can be used as clients, servers, or both.
- Explain the use of network devices.
- Compare the devices and topologies of a LAN to the devices and topologies of a WAN.
- Describe the basic structure of the Internet.
- Explain how LANs and WANs interconnect to the Internet.
- Explain the concept of a converged network.
- Describe the four basic requirements of a reliable network.
- Explain how trends such as BYOD, online collaboration, video, and cloud computing are changing the way we interact.
- Explain how networking technologies are changing the home environment.
- Identify basic security threats and solutions for both small and large networks.
- Describe the importance of understanding the underlying switching and routing infrastructure of a network.

Chapter 2: Configuring a Network Operating System
- Explain the purpose of Cisco IOS.
- Explain how to access a Cisco IOS device for configuration purposes.
- Explain how to navigate Cisco IOS to configure network devices.
- Describe the command structure of Cisco IOS software.
- Configure hostnames on a Cisco IOS device using the CLI.
- Use Cisco IOS commands to limit access to device configurations.
- Use IOS commands to save the running configuration.
- Explain how devices communicate across network media.
- Configure a host device with an IP address.
- Verify connectivity between two end devices.
- Explain the features and functions of Cisco IOS Software.
- Configure initial settings on a network device using the Cisco IOS software.
- Given an IP addressing scheme, configure IP address parameters on end devices to provide end-to-end connectivity in a small to medium-sized business network.
Chapter 3: Network Protocols and Communications
- Describe the types of rules that are necessary to successfully communicate.
- Explain why protocols are necessary in communication.
- Explain the purpose of adhering to a protocol suite.
- Explain the role of standards organizations in establishing protocols for network interoperability.
- Explain how the TCP/IP model and the OSI model are used to facilitate standardization in the communication process.
- Explain how data encapsulation allows data to be transported across the network.
- Explain how local hosts access local resources on a network.

Chapter 4: Network Access
- Identify device connectivity options.
- Describe the purpose and functions of the physical layer in the network.
- Describe basic principles of the physical layer standards.
- Identify the basic characteristics of copper cabling.
- Build a UTP cable used in Ethernet networks (scope – does not include cabling area discussion).
- Describe fiber-optic cabling and its main advantages over other media.
- Connect devices using wired and wireless media.
- Describe the purpose and function of the data link layer in preparing communication for transmission on specific media.
- Compare the functions of logical topologies and physical topologies.
- Describe the basic characteristics of media access control methods on WAN topologies.
- Describe the basic characteristics of media access control methods on LAN topologies.
- Describe the characteristics and functions of the data link frame.

Chapter 5: Ethernet
- Explain how the Ethernet sublayers are related to the frame fields.
- Describe the Ethernet MAC address.
- Explain how a switch operates.
- Explain how a switch builds its MAC address table and forwards frames.
- Describe switch forwarding methods.
- Describe the types of port settings available for Layer 2 switches.
- Compare the roles of the MAC address and the IP address.
- Describe the purpose of ARP.
- Explain how ARP requests impact network and host performance.

Chapter 6: Network Layer
- Describe the purpose of the network layer in data communication.
- Explain why the IPv4 protocol requires other layers to provide reliability. (To include: media independent, unreliable, and connectionless.)
- Explain the role of the major header fields in the IPv4 packet.
- Explain the role of the major header fields in the IPv6 packet.
- Explain how a host device uses routing tables to direct packets to itself, a local destination, or a default gateway.
- Compare a host routing table to a routing table in a router.
- Describe the common components and interfaces of a router.
- Describe the boot-up process of a Cisco IOS router.
• Describe the common components and interfaces of a router.
• Describe the boot-up process of a Cisco IOS router.
• Configure initial settings on a Cisco IOS router.
• Configure two active interfaces on a Cisco IOS router.
• Configure devices to use the default gateway.

Chapter 7: IP Addressing
• Convert between binary and decimal numbering systems.
• Describe the structure of an IPv4 address including the network portion, the host portion, and the subnet mask.
• Compare the characteristics and uses of the unicast, broadcast, and multicast IPv4 addresses.
• Explain public, private, and reserved IPv4 addresses.
• Explain the need for IPv6 addressing.
• Describe the representation of an IPv6 address.
• Describe types of IPv6 network addresses.
• Configure global unicast addresses.
• Describe multicast addresses.
• Explain how ICMP is used to test network connectivity.
• Use ping and traceroute utilities to test network connectivity.

Chapter 8: Subnetting IP Networks
• Explain how subnetting segments a network to enable better communication.
• Explain how to calculate IPv4 subnets for a /24 prefix.
• Explain how to calculate IPv4 subnets for a /16 and /8 prefix.
• Given a set of requirements for subnetting, implement an IPv4 addressing scheme.
• Explain how to create a flexible addressing scheme using variable length subnet masking (VLSM).
• Implement a VLSM addressing scheme.
• Explain how to implement IPv6 address assignments in a business network.

Chapter 9: Transport Layer
• Describe the purpose of the transport layer in managing the transportation of data in end-to-end communication.
• Describe characteristics of the TCP and UDP protocols, including port numbers and their uses.
• Explain how TCP session establishment and termination processes facilitate reliable communication.
• Explain how TCP protocol data units are transmitted and acknowledged to guarantee delivery.
• Describe the UDP client processes to establish communication with a server.
• Compare UDP and TCP.

Chapter 10: Application Layer
• Explain how the functions of the application layer, session layer, and presentation layer work together to provide network services to end user applications.
• Explain how common application layer protocols interact with end user applications.
• Explain how web and email protocols operate.
• Explain how the IP addressing protocols operate.
Chapter 11: Build a Small Network

- Identify the devices used in a small network.
- Identify the protocols used in a small network.
- Explain how a small network serves as the basis of larger networks.
- Identify why security measures are necessary on network devices.
- Identify security vulnerabilities.
- Identify general mitigation techniques.
- Configure network devices with device hardening features to mitigate security threats.
- Apply the commands to back up and restore an IOS configuration file.
- Use the output of the ping command to establish relative network performance.
- Use the output of the traceroute command to establish relative network performance.
- Use show commands to verify the configuration and status of network devices.
- Use host and IOS commands to acquire information about network devices.

Requirements for Successful Course Completion:

- Average score of 70%, or greater, on all chapter assessments and final exam.
- Participants may take exams up to 3 times.
- Complete all assigned Packet Tracer labs.

Upon Successful Course Completion Learners Will Receive:

- SCTE/ISBE Course Completion Certificate
- Cisco Network Academy Course Completion Certificate
- 3 Recertification Units (RUs) toward SCTE/ISBE certification renewal

Certification Exam Information:

- After completing CCNA1: Introduction to Networks and CCNA2: Routing and Switching Essentials students are prepared for the Interconnecting Cisco Network Devices 1 (ICND1) or Certified Cisco Entry Level Technician (CCENT) exam number 100-105. CCENT / ICND1 is an optional step to earn a CCNA.

- After completing CCNA1 to CCNA4 students may take the Certified Cisco Network Associate (CCNA) exam number 200-125.

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\text{CCNA1 + CCNA2 = ICND1 / CCENT}
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\text{CCNA1 + CCNA2 + CCNA3 + CCNA 4 = CCNA}
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The CCNA program also helps individuals prepare for the SCTE/ISBE IPEP Certification.

NOTE: Cisco certification exams are scheduled at Pearson VUE: http://pearsonvue.com/cisco/