Networking Academy

Networking Devices and Initial Configuration

Scope and Sequence

Version 1.0

Contents

Target Audience

The Networking Devices and Initial Configuration course is appropriate for learners with a high school reading proficiency, basic computer literacy, and interest in pursuing an entry-level IT job.

Prerequisites

It is recommended learners complete the Networking Basics course or have equivalent knowledge

Certification Alignment

This course, from the Cybersecurity Career Path, aligns with the CCST Cybersecurity certification (formerly known as IT Specialist Cybersecurity certification from Certiport).

Course Description

Networking Devices and Initial Configuration teaches intermediate knowledge and skills for networking by covering basic concepts and skills needed to build a home office network and a small Cisco office network. The learner is presented with an engaging and exploratory view of networks, the devices that comprise them, how they work, and troubleshooting tools and techniques. It prepares the learner to move into Cybersecurity or DevNet by going deeper into Ethernet, IP Addressing and the transport layer. It also covers Cisco device configuration and ends with the ability to configure and troubleshoot a small Cisco network. The course has many features to help students better comprehend these concepts:

- Rich multimedia content, including interactive activities, videos, games, and quizzes address a variety of learning styles stimulating learning and increasing knowledge retention.
- Labs and Cisco Packet Tracer simulation-based learning activities develop critical thinking abilities and complex problem-solving skills.
- Innovative assessments provide immediate feedback evaluating knowledge and acquired skills.
- Technical concepts are explained using language that works well for learners at all levels. Embedded interactive activities breaks-up reading large content blocks and reinforces understanding.
- The course emphasizes applied skills and encourages learners to continue a networking education.

Course Objectives

Networking Devices and Initial Configuration provides an intermediate overview of network design, structure, and operations. The online course material assists learners communicate their knowledge and can develop their desire to specialize in networking-related professions. Upon completion of Networking Devices and Initial Configuration, learners can perform the following:

- Explain components of a hierarchical network design.
- Explain the characteristics of virtualization and cloud services.

- Calculate numbers between decimal, binary, and hexadecimal systems.
- Explain how Ethernet operates in a switched network.
- Explain how routers use network layer protocols and services to enable end-to-end connectivity.
- Calculate an IPv4 subnetting scheme to efficiently segment a network.
- Explain how ARP enables communication on a local area network.
- Explain how DNS and DHCP services operate.
- Compare the operations of transport layer protocols in supporting end-to-end communication.
- Use the Cisco IOS.
- Build a simple computer network using Cisco devices.
- Use various tools to test network connectivity.

Equipment Requirements

For the best learning experience, we recommend using a Personal Computer (PC) for the Cisco Packet Tracer activities.

Software

- Cisco Packet Tracer activities are designed to use Packet Tracer 8.1 or higher

Recommended PC Hardware Requirements

- Computer with either Windows (8.1, 10, 11), MacOS (10.14 or newer) or Ubuntu 20.04 LTS operating system, amd64(x86-64) CPU, 4 GB of free RAM, 10 GB of free disk space. (Not supported: macOS with a M1 CPU and Chromebooks)
- High speed internet access

Course Outline

Networking Devices and Initial Configuration provides a comprehensive overview of network design needs, addressing specifics, component configuration, and how to test a network.

Table 1 details the modules and associated competencies. 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 depends on the depth of knowledge and skill needed to master the competency.

Table 1: Module Title and Objective

Module Title / Topic Title	Objective
Module 1 Network Design	
1.0 Network Design	Explain components of a hierarchical network design.
1.1 Reliable Networks	Describe the four basic requirements of a reliable network.
1.2 Hierarchical Network Design	Explain the function at each layer of the 3-layer network design model.
Module 2 Cloud and Virtualization	
2.0 Cloud and Virtualization	Explain the characteristics of virtualization and cloud services.
2.1 Cloud and Cloud Services	Explain the characteristics of clouds and cloud services.
2.2 Virtualization	Explain the purpose and characteristics of virtualization
Module 3 Number Systems	
3.0 Number Systems	Calculate numbers between decimal, binary, and hexadecimal systems.
3.1 Binary Number System	Calculate numbers between decimal and binary systems.
3.2 Hexadecimal Number System	Calculate numbers between decimal and hexadecimal systems.
Module 4 Ethernet Switching	
4.0 Ethernet Switching	Explain how Ethernet operates in a switched network.
4.1 Ethernet	Explain the OSI model Layer 1 and Layer 2 functions in an Ethernet network.
4.2 Ethernet Frames	Explain how the Ethernet sublayers are related to the frame fields.
4.3 Ethernet MAC Address	Explain the types of Ethernet MAC addresses.
4.4 The MAC Address Table	Explain how a switch builds its MAC address table and forwards frames.
Module 5 Network Layer	
5.0 Network Layer	Explain how routers use network layer protocols and services to enable end-to-end connectivity.
5.1 Network Layer Characteristics	Explain how the network layer uses IP protocols for reliable communications.
5.2 IPv4 Packet	Explain the role of the major header fields in the IPv4 packet.
5.3 IPv6 Packet	Explain the role of the major header fields in the IPv6 packet.
Module 6 IPv4 Addressing	
6.0 IPv4 Addressing	Calculate an IPv4 subnetting scheme to efficiently segment a network.
6.1 IPv4 Address Structure	Describe the structure of an IPv4 address including the network portion, the host portion, and the subnet mask.
Module 7 Address Resolution	
7.0 Address Resolution	Explain how ARP enables communication on a local area network.

Module Title / Topic Title	Objective
7.1 ARP	Describe the purpose of ARP.
Module 8 IP Addressing Services	
8.0 IP Addressing Services	Explain how DNS and DHCP services operate.
8.1 DNS Services	Explain how DNS operates.
8.2 DHCP Services	Explain how DHCP operates.
Module 9 Transport Layer	
9.0 Transport Layer	Compare the operations of transport layer protocols in supporting end-to-end communication.
9.1 Transportation of Data	Explain the purpose of the transport layer in managing the transportation of data in end-to-end communication.
9.2 TCP Overview	Explain characteristics of TCP.
9.3 UDP Overview	Explain characteristics of UDP.
9.4 Port Numbers	Explain how TCP and UDP use port numbers.
9.5 TCP Communication Process	Explain how TCP session establishment and termination processes facilitate reliable communication.
9.6 Reliability and Flow Control	Explain how TCP protocol data units are transmitted and acknowledged to guarantee delivery.
9.7 UDP Communication	Describe the UDP client processes to establish communication with a server.
Module 10 The Cisco IOS Command Line	
10.0 The Cisco IOS Command Line	Use the Cisco IOS.
10.1 IOS Navigation	Use correct commands to navigate the Cisco IOS modes.
10.2 The Command Structure	Explain how to navigate the Cisco IOS to configure network devices.
10.3 View Device Information	Use show commands to monitor device operations.
Module 11 Build a Small Cisco Network	
11.0 Build a Small Cisco Network	Build a simple computer network using Cisco devices.
11.1 Basic Switch Configuration	Configure initial settings on a Cisco switch.
11.2 Configure Initial Router Settings	Configure initial settings on a router.
11.3 Secure the Devices	Configure devices for secure remote management.
11.4 Configure the Default Gateway	Configure devices to use the default gateway.
Module 12 ICMP	
12.0 ICMP	Use various tools to test network connectivity.
12.1 ICMP Messages	Explain how ICMP is used to test network connectivity.
12.2 Ping and Traceroute Testing	Use ping and traceroute utilities to test network connectivity.