Computer Networking Basics

**Lesson Description:** In this learning module, students will learn the core elements of a computer network, and the purpose of computer networks. Students will identify and explain all the networking hardware. Students will also learn what an Internet Protocol (IP) and MAC address is, and why they are important within a computer network.

**Prerequisite Knowledge:** None

**Length of Completion**: 90 minutes

**Level of Instruction:** High School or Middle school introductory level.

**Applicable First Principles &/or Concepts:**

**GenCyber First Principles**

Domain Separation Abstraction

Process Isolation Data Hiding

Resource Encapsulation Layering

Modularity Simplicity

Least Privilege Minimization

**GenCyber Cybersecurity Concepts**

Defense in Depth **Availability**

Confidentiality Think Like an Adversary

**Integrity** Keep it Simple

**Resources that are Needed:** To complete this lesson, the student will need a computer with an Ethernet connection, a managed switch, networking cables, string (to simulate a network), envelopes and paperclips.

**Accommodations Needed:** May need someone to read items that are on the screens or slips of paper if there is a visually impaired participant.

# learning outcomes

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* Identify and explain the purpose of networking hardware
* Explain the connections between computers and switches
* Explain how data will flow between computers/devices
* Apply an IP and MAC address within data flow
* Describe how data will flow within a network
* Explain to others how data will flow on a network

# Lesson Details

**Interconnection:** Lays out foundations of networking which will be referenced in remaining lessons of the day, as well as lessons on Tuesday and Thursday of this week. 1.3 Wired Networking Basics; 1.4 Wireless Router Setup; 1.5 Wireless Networking Basics; 4.1 Connecting Raspberry Pi to the Network.

**Assessment:** Post exercise discussions, Observations, Walk around.

**Extension Activities:** None

**Differentiated Learning Opportunities:** Students with some networking experience could research different network topologies and try them with the string/envelope exercise.

# lesson 1.2

**Lesson 1.2 Details:**

**Warm Up:** Strings & Envelopes Exercise

Each table group will receive 10 pieces of string, an envelope with a piece of paper and a binder clip. One person’s name will be written on the envelope and a question on the card. The students will form a ring topology and direct the note to the person named. He/she will answer the question and send back to the originator. The exercise will be repeated with a hub topology.

**Lesson:**

Activity 1: The student will identify an Ethernet port, an Ethernet cable, a switch and a router. The hardware and terminology is critical.

Activity 2: The students will look up their IP address and MAC address on their computer. This may include the wireless IP address, and how to interpret the IPCONFIG command within the Command Prompt. This information will be critical in the upcoming lessons on wired and wireless networks. Students will connect their computer station to a router/switch to see how their system is connected. They will then determine their IP and MAC addresses, and share with other students.

Activity 3: Students will sketch their home networks identifying items on it with proper terminology learned. This will help them see the lesson from a practice standpoint and reinforce the topics/terminology learned.

Introduction to Networking PowerPoint

Video on OSI Model (<https://www.youtube.com/watch?v=VGGmBhARuiY>)

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