Wired Networking Basics

**Lesson Description:** In this learning module, students will identify and explain the devices and connectivity on a wired network. Students will use networking commands in the Command Prompt (IPCONFIG) to determine the MAC address of the computer, and the IP address for each network interface on the computer, based on connectivity. The students will also use the PING and TRACERT commands to verify communications with another network station.

**Prerequisite Knowledge:** Previous knowledge on IP addressing and MAC addressing.

**Length of Completion**: 55 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, network wireless and a managed station router with to switch station RJ-45 ports, 6 networking cables of different colors, a computer with an RJ-45 Ethernet connector.

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

# learning outcomes

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* Identify the hardware required for a wired network
* Explain the purpose of different types of networking cable configurations
* Explain what a client/server system is
* Explain the advantages of a wired network system
* Explain the path of data flow between computers using a small group network configuration

# 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. 1.4 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:**

# lesson 1.3

**Lesson 1.3 Details:**

**Warm Up:** Create an IP Address

Each table group will come up with an IP address system for your table. An IP address is 4 octets of numbers from 0-255 for example 168.212.226.204. Develop a system where the first octet represents the building, the second octet the room, the third your table and the fourth your seat. Jot these numbers down on your name tag.

**Lesson:**

Activity 1. Participants will connect the laptops to a switch with an Ethernet cable. Students will learn what the lights are for on the switch and the different sections of a switch. This will be compared to the hardware connections on a wireless router.

Activity 2. Setup the network adapter to a DHCP setting, so the service in the router will give an internal IP address to the NIC.

Activity 3. The participants will configure the NIC to have a static IP address, as specified by the instructor, as well as a subnet mask value.

Activity 4. The participants will ping the IP addresses of the other computer stations within the room. This way they can see what a failed communication looks like, as well as a successful connection. Tracert, TTL and retry will be discussed.

- Describe the Teacher Instruction:

Warm up, 20 minutes of lecture with a Power Point, supporting PDF materials, and through demonstration to explain all of the hardware on a wired network, and basic network adapter setup. The participants will perform activities 1 & 2. The instructor will then show how to setup a static IP address, and why this is done in some applications. The instructor will go over the important PING command, and demonstrate the information shown on the screen to do this. The students will then perform activity 3 & 4.

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