Password Cracking

**Lesson Description:** In this learning module, the teachers will learn how passwords are protected through a process called hashing, versus encryption. Companies that store login passwords also use a more advanced method of security called salting. The teachers will use the security testing features of the Raspberry Pi to try to crack passwords.

**Prerequisite Knowledge:** Basic understanding of the Raspberry Pi hardware and operating system.

**Length of Completion**: 60 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:** A new Raspberry Pi kit, external monitor (HDMI input), external keyboard, and external mouse (USB connectors), and a webcam. A PC computer is also required.

**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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* Explain password hashing (high level)
* Explain password salting (high level)
* Explain password encryption (high level)
* Explain why passwords must be protected at all times
* Demonstrate password cracking

# Lesson Details

**Interconnection:** Lays out foundations of staying safe on the computer which will be built upon further in lesson

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

**Extension Activities:** Teachers can research the different online services they use (banking, streaming services, social media, and computer systems) and what is allowed for passwords with each service.

A great article that explains hashing and salting is: https://www.wired.com/2016/06/hacker-lexicon-password-hashing/

**Differentiated Learning Opportunities:** None

# lesson 2.4

**Lesson 2.4 Details:**

**Warm Up:** Have students give examples of good and bad passwords

**Lesson:**

Instructor will demonstrate how to crack a password using the tools within the OS. Teachers will then practice and demonstrate password cracking using their Raspberry Pi.

- Describe the Teacher Instruction:

5 minutes for warm up, 20 minutes for slides and lecture, 5 minutes to demonstrate how to crack a password, 20 minutes for password cracking exercise, and 10 minutes for troubleshooting and questions. The following topics will be discussed:

1. Hashing

a. MD 5

b. SHA

2. Salting

3. Encryption

4. Location of passwords

5. Kali

a. Linux for security testing

b. How tools are categorized

c. Safety and legality of tools

6. Password cracking

Acknowledgement: Lesson developed by Mike Kwiatkowski & Roger Spears.