GE M03: Abstractions, Encoding, Internet and Cybersecurity

Points: 25 See Rubric in Canvas
Due Date: Due date listed in Canvas but some sections will be due as class participation before. Create Calendar reminders

- Final submission will be accepted up to 24 hours after the due date with a 10% penalty. Meaning if you turn it in at 12:01 am of the next day you will be deducted 10% of the total points from your score.
- If the assignment is more than 24 hours late, it will be a 0.

**Submission:** Upload each file and not a zip file.

- Upload this document as a word or pdf document in the highlighted box areas.
- Upload your completed CS1030_M03_Spreadsheet containing
  - Binary Conversion
  - Example Caesar Cipher Encryption
- 2.2 Upload your Cybersecurity Impact Creation if it is PDF or powerpoint

Objectives
1. Understand how packets, IP, TCP, DNS, and HTTP work together to keep the Internet reliable.
2. Investigate common cybersecurity threats and the role of encryption in securing communication.
3. **Communicate key ways for others to stay secure online that are accessible and inclusive.**

Effort: You are encouraged to collaborate to discuss concepts and explore writing code together. Write your technical documentation and answer the questions in your own words. You can use AI tools but follow CS Academic Integrity and AI Usage Policy - Harding

If you download this as a word document and you have any problems typing your answer in the tables you must click on 3 dots and remove content control.

Part 1 Explore and Explain
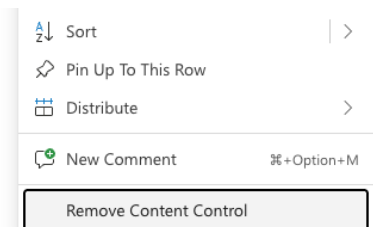
Part 1 Explore and Explain

1.1 Data Encoding Schemes

Open your copy from the lecture [CS1030_M03_Spreadsheet.xlsx](#)

> 1. In your own words, what is *abstraction* and why is it important in computing? Give an example of something you have used in this course already to help remove the complexity.
> Abstraction is when you make something less realistic and complex but still provide enough detail to make a conclusion on it.
> I sometimes use chat gpt to simplify a question to help me understand what it is asking.

> 2. Why do computers use **binary (1s and 0s)** instead of decimal numbers?
> Since a computer is made of wires the binary system tells us if the wire is charged or not. Charged being 1 and no charge being zero, and collecting multiple wires to one part gives you a wide range on number you can make as the more bits you have the numbers you have increases exponentially. For exampl something with 2 bits can give you a total abount of 4 options. While 5 bits could give you 32

> 3. What advantage does the **hexadecimal system** have for representing colors compared to rgb. Include examples of representing colors in both encoding schemes.
> With rgb its a number for each color from 0 -255, so you can have specialized colors based on different amount of each color
>
> Hexidecimel is the same with base 16 for the 5 bits with 6 colors 2 red, 2 blue, and 2 green

4. What functions did you use in Google Sheets/Excel to convert binary to decimal?
I used the power functions so it gives me the power of the given number.

5. What was the biggest challenge in setting up your spreadsheet converter? How did you solve it?
Making sure all the equations had the correct relationship to the other box's and have the correct true;false statements.

1.2 Internet Fundamentals

1.2.1 : Packets and Routing

Show that data is broken into packets and travels different routes.

1. Open the command line:
   a. Windows: Open Command Prompt (type 'cmd' in search).
   b. macOS: Open Terminal from Applications → Utilities.
   c. Linux: Open Terminal.
2. Run traceroute (or tracert on Windows):
   a. Windows: tracert 8.8.8.8
   b. macOS/Linux: traceroute 8.8.8.8
3. Repeat the trace 3 times to the same destination.

Record your results in the table below.

Run #	Destination	Total Hops	Timeouts (*)	Notable Router Names
1	8.8.8.8		1	
2	8.8.8.8		1	
3	8.8.8.8			

2. Paste Run 1 results below.

3. How many hops did it take to get to Google?
Run 1:
Run 2:
Run 3:

4. Why did the number of hops or the router names differ between runs?

Run an additional traceroute to your school website www.msudenver.edu

5.. Compare your results with other classmates. What differences did you notice?

6. How does this demonstrate Internet reliability and fault tolerance?

1.2.2 IP Addresses & DNS

Understand IP addresses and how DNS translates human-friendly names into IPs.

Find your public IP address:
1. Go to https://whatismyipaddress.com
2. Perform a DNS lookup: Go back to your command window you were using above. Type in nslookup followed by URL
   nslookup www.msudenver.edu

Website	Domain Name	IP Address Returned
www.msudenver.edu	www.msudenver.edu	
www.google.com	www.google.com	

1. Why do we use domain names instead of numerical IP addresses?

2. Did you get the same IP addresses for www.google.com? Why or why not?

3. How does DNS make the Internet more usable for humans?

1.3 Cybersecurity Game Exploration

Pick **one** game to explore. Each game will teach you about real cyber threats and defenses. After playing, complete your reflection questions.

[KC7 Cyber Detective](#)

- **What it is:** Solve cybercrime cases by analyzing logs and investigating evidence.
- **What you'll learn:**
  - Threat detection (spotting suspicious activity)
  - Social engineering (how attackers trick people)
  - Incident response (steps after a breach)
- **Setup:** Free, login saves your work. Runs in a browser.
  Best for: Beginners who want a story-driven experience.

[TryHackMe: Introduction to Cybersecurity](#)
- **What it is:** Hands-on labs that simulate real cyber threats and defenses.
- **What you'll learn:**
  - Phishing and password security
  - Encryption and hashing
  - Firewalls and basic defenses
- **Setup:** Free account required, progress is saved. Some labs use a browser-based virtual machine (no installs needed).
- **Best for:** Students who want guided technical labs.

[OverTheWire: Bandit](#)
- What it is: A command-line "wargame" where you hack your way through levels.
- What you'll learn:
  - Linux/command line basics
  - Secure Shell (SSH)
  - Privilege escalation techniques
- Setup: 100% free, requires SSH connection. Progress not saved in the system — you must keep your own notes/passwords.
- Best for: Students who want a challenge and are curious about "hacker-style" problem solving.

1. What game did you choose? What was your biggest challenge?
2. Your favorite part?

3. List and briefly explain **3 cybersecurity terms or concepts** you learned (e.g., phishing, SSH, incident response).

4. Which **tools or defenses** did you encounter in the game? (e.g., firewalls, encryption, log analysis)

5. List 4 keys to how a company or individual could **protect against the threats** you encountered in the game?

1.4 Encryption

You will upload your CS1030_M03_Spreadsheet.xlsx containing your Encryption example from the lecture.

2 Analyze and Apply

2.1 Model How Information Travels Securely

Draw on paper, tablet or white board to model the following. Then take a picture of the drawing and include the image in this document. Make sure it is cropped and readable.

Part 1 – How Information from Amazon is Loaded

- Draw how your browser requests the Amazon homepage.
- Show data broken into packets, routed across the Internet, and reassembled by your browser.
- Include routers/paths, IP addresses, and DNS if possible.
- Focus: reliability and fault tolerance.

Put your image of your drawing below and make sure it is cropped to be readable.

Part 2 – How Encryption Protects a Purchase

- Draw how your browser sends credit card information to Amazon's server.
- Show the use of Public and Private Keys to share a Session Key.
- Show your payment data being encrypted with the session key before it travels.
- Focus: How encryption provides confidentiality and trust.

Put your image of your drawing below and make sure it is cropped to be readable.

2.2 Cybersecurity Impact Creation

- Who might face barriers to practicing good cybersecurity (e.g., access to devices, reliable Internet, language)?
- How could these barriers be addressed?
- Who is your audience you want to share what you make?

Choose one way to help you and others be more secure online. Include accessibility best practices for your audience

Examples:
- Show how to set up and use a password manager.
- Create a tips sheet with your Top 5 Cybersecurity Best Practices
- Make a poster, video, webpage, or slideshow teaching a specific security skill (topics such as avoiding phishing, using passkeys).
    - The webpage can be added to your portfolio website

Your product should be clear, creative, and accurate.
PDF or slideshow but if a video or webpage put the link below.

Link to Video or webpage

4 Reflection

1. Who might face barriers to practicing good cybersecurity (e.g., access to devices, reliable Internet, language)? How could these barriers be addressed?

2. You created something to help others be secure. What strategies did you use to explain technical ideas in simple, accessible ways?

3. What actions did you or will you take after learning more about the Internet and Cybersecurity concepts

4. How does what you learned in this module
packets, IP/DNS and encryption, apply to the portfolio website you created?

5. How do encoding systems like **RGB and hexadecimal** make it possible to represent colors on your portfolio website?