Assignment 1 - Exploring Network Traffic w/Command-Line Tools

Objective
The objective of this assignment is to use common networking commands to explore how your computer communicates on a network. For each command, you will: 1) Run the command in your terminal or command prompt. 2) Take a screenshot of the output. 3) Answer three questions that demonstrate your understanding of the information returned. Feel free to review the previous ZyBook reading or search the web to interpret the results from the command. You will compile your screenshots and answers into a single document, encrypt it using the instructor's public key, and submit according to the instructions below.

Part 1: Network Information Lookup *For the commands that involve a domain name, you can use a different name if you prefer.

Command 1: `ipconfig (Windows)/ifconfig (macOS)`
Purpose: Displays your device's network configuration, including IP address and network interfaces.

Answer the following questions:
- What is the IPv4 address of your active network interface, and what does this address represent?
- What network interface appears to be in use (e.g., Ethernet, Wi-Fi), and how can you tell?
- Why is this information useful when troubleshooting network connectivity issues?

Command 2: `hostname`
Purpose: Displays the name of your computer on the network.

Answer the following questions:
- What is the hostname of your system, and how is it used on a network?
- How might a hostname be helpful to a network administrator?
- Would two devices on the same network be allowed to have the same hostname? Why or why not?

Command 3: `ping loopluxuryliving.com`
Purpose: Test connectivity by sending packets to a remote system.

Answer the following questions:
- Was the destination reachable? How can you tell from the output?
- What does the response time (latency) indicate about the connection?
- What does the packet loss mean, and did you observe any in your results?

Command 4: `tracert (Windows)/traceroute (macOS) loopluxuryliving.com`
Purpose: Displays the path network traffic takes to reach a destination.

Answer the following questions:
- How many hops were required to reach the destination?
- What does each hop represent in the output?
- How could this command help diagnose slow or failing network connections?

Command 5: `nslookup loopluxuryliving.com`
Purpose: Resolves domain names into IP addresses using DNS.

Answer the following questions:
- What IP address(es) were returned for the domain?
- Why might a single domain name resolve to multiple IP addresses?
- What role does DNS play in everyday internet use? *We haven't specifically talked about DNS in our class, but here is a good YouTube video that provides a quick overview - https://www.youtube.com/watch?v=UVR9lhUGAyU

Command 6: `curl https://loopluxuryliving.com`
Purpose: Sends HTTP requests and retrieves responses from a web server.

Answer the following questions:
- What type of data is returned by this command?
- How does this command differ from using a web browser?
- Why might a network administrator or developer use `curl` for testing?

Part 2: Encrypting the Assignment

For Asymmetric encryption, I'll use OpenSSL. Most Windows and Mac users already have OpenSSL installed by default. If not, the easiest way to install OpenSSL is to install Git from git-scm.org. Git comes bundled with OpenSSL. OpenSSL's rsault works well for small files (like PDFs). In real-world settings, we can use hybrid encryption (AES + RSA), which mirrors secure file transfer.

1. Download the instructor's Public Key from the assignment into a folder on your computer. This folder will also serve as that area where you will need to encrypt your assignment - `file name: instructor_public_key.pem`
2. In your terminal, navigate to the file location of your assignment and the instructor_public_key.pem file and run the command below. Be sure to adjust the filename according to how you named the file for assignment one.
   - `openssl rsautl -encrypt -inkey instructor_public_key.pem -pubin -in assignment_one.pdf -out assignment_one.enc`
3. Submit assignment_one.enc file by email to cfulton@luc.edu . The subject line should be [Encrypted Assignment One] - Your Loyola username. Ex. [Encrypted Assignment One] - cfulton

Submission
Step 1: Submit an unencrypted version, either PDF or word doc, before the due date and time listed in Sakai. Acceptable file extensions include .docx and .pdf.
Step 2: You will also need to email me an encrypted version of your file. Email the encrypted file only to cfulton@luc.edu