Computer Networks & Cloud Computing

Assignment #2

"IPv4 Network Diagnostics and Basic Automation using Networking Commands "

1. Objectives

By completing this assignment, students will be able to:

- Use basic IPv4 networking commands to diagnose network connectivity.
- Understand how these commands interact with network layers.
- Write simple code (pseudo-code or Python) to automate network tests.
- Interpret outputs and troubleshoot basic network issues.

2. Materials

All the texts from professor, the recommended textbook and results from searches on the Web can be used, but they need to be properly referenced in the document (see 'Final notes' for additional indications).

Plagiarism is not accepted and it is severely recommended to be avoided.

3. Expected Outcomes

- **Outcome** - should be a report (single .pdf or.docx) with maximum of twenty (25) pages in which you will present the answer to all the points required, e.g., containing:
    a. All outputs and explanations from Part 1
    b. The script (as text or screenshot)
    c. The reflection report

- This report has a cover page with indication of the members of the group (**student number / student name**). This report will be uploaded to Moodle.
- Attach the **script file** separately if using Python (e.g., ping_tool.py)
- Create a .zip file with the report and the script file
- Submit through the course platform (e.g., Moodle, Google Classroom)

4. Important Dates

Date	Action/Activity	Remarks
24/Apr/2025	Assignment Delivery	Using Moodle
Until 16/May/2025 (23h59)	Assignment Closing	Each **student group** has to deliver the result of the work, uploading it to the proper resource in Moodle.

5. Assignment Tasks

Part 1 – Manual Use of IPv4 Networking Commands (40%)

Use **any operating system** (Windows, Linux, or macOS) and perform the following tasks using **IPv4 networking commands only**:

1. Run and **document the output** of the following commands (use your own computer or virtual machine):
   - `ipconfig` (Windows) or `ifconfig/ip addr` (Linux/macOS)
   - `ping` to:
     - the localhost (`127.0.0.1`)
     - the default gateway
     - an external server (e.g., `8.8.8.8`)
   - `tracert` (Windows) or `traceroute` (Linux/macOS)
   - `netstat -rn` or `route`
   - `nslookup` or `dig` for any website
2. For each command:
   - Briefly **explain** its purpose.
   - Interpret the key parts of the output.
   - Identify what layer(s) of the OSI model the command interacts with.
3. Take **screenshots** or include **outputs** as part of your submission.

Part 2 – Simple Script for Network Diagnostics (40%)

Write a **script** (in either **pseudo-code** or **Python**) that does the following:

1. **Pings** a list of IP addresses or domain names (e.g., `8.8.8.8`, `google.com`, `your router IP`, etc.).
2. Stores the result of each ping (reachable/unreachable, time).
3. **Logs the result** with timestamp into a text file named `ping_log.txt`.

Bonus (+5%) if your script includes basic error handling (e.g., if host is unreachable).

Note: provide all the code in the report!

Part 3 – Short Reflection Report (20%)

Write a brief report (max. 300 words) reflecting on:

- What did you learn from the assignment?
- What problems did you encounter?
- How would you expand this tool in a real organization?

6. Final Notes

Wikipedia and similar Websites do not qualify as quality resources. Neither ChatGPT because of the silly things it adds to answers on more technical topics, like the ones in this assignment.

Your assignment must follow these formatting requirements: be typed, double spaced, using Calibri (Body) font (size 12), with one-inch margins on all sides; citations and references must follow APA or school-specific format.

Format of the final document must be .pdf.

Include a cover page containing the title of the assignment, all student's names in the working team, the professor's name, the course title, and the date. The cover page and the reference(s) page(s) are not included in the required assignment page length.

This assignment is designed to bridge the gap between theory and practical diagnostics in networked environments. You are encouraged to try both Windows and Linux/Mac terminals if possible, to understand the differences in toolsets.

7. Evaluation Rubric

Criterion	Weight
Correct usage of commands	20%
Explanation of outputs and OSI link	20%
Working code (pseudo-code or Python)	30%
Logging and structure of code	10%
Reflection and insights	15%
Presentation, format, clarity	5%