Homework 5: Mininet

Due Date: April 25, 2025

Goal

In a tool called mininet, you will design subnets that satisfy specified requirements. There are three routers A, B, and C, each of which is connected to two hosts. Also, the three routers themselves are connected to each other with IP addresses 20.10.100.0/24. You need to design subnets (LAN A, B, and C) that connect the two hosts to each router.

Task 1: You are not writing any code for this task. Design (on paper) subnets that satisfy the following constraints:

- The IP address space is 20.10.172.0—20.10.172.255.
- LAN A has at least 50 hosts
- LAN B has at least 75 hosts
- LAN C has at least 20 hosts.

In the report, for each LAN specify:

- Subnet Mask
- Network Address
- Smallest IP address
- Highest IP address

Task 2:

Install Mininet: http://mininet.org/download/

Write a python script `layer3_network_code.py` that uses mininet to create the network specifed above. In the code, make sure to assign an IP address and subnet mask to each network interface. Test (perhaps using "pingall" command) if each host on the same LAN is reachable. Note that you cannot reach a host on a different LAN as the routers are not yet configured. Show the reachability information in the report.

Task 3:

- On each host, add a route for each destination using: sudo route add -net ADDR netmask NETMASK gw GATEWAY
- Also, add rules on each router.
- Test using ping and traceroute. Show screenshots of the output in the report.

Instructions

1. **Programming Language:**
    a. You must use **Python** to implement your code (Useful link: https://www.python.org)
    b. Follow the PEP 8 coding guidelines for writing clean and professional Python code. (Here is a link: https://peps.python.org/pep-0008/)
    c. Use `git` for version control of your code
2. **Code Documentation and Comments:**
    a. Properly comment your code to make it clear and understandable
    b. Generate a PDF documentation for your code using a tool like Sphinx that automatically generates it for you. (see this link: https://www.sphinx-doc.org/en/master/). There are other tools that provide similar functionality (i.e. automatically generates documentation for you). You can use any of them if you dont like sphinx
3. **What to Submit:** All files must be submitted in a **single zip file**. Name the zip file <firstname>_<lastname>_hw5.zip (replace <firstname> and <lastname> with your name). The zip will have **atleast the following files**:
    a. **Python code**: Python files containing the code you wrote
    b. **Requirements File**: Submit a `requirements.txt` file listing all the Python dependencies required to run your code. (See this link: https://www.geeksforgeeks.org/how-to-create-requirements-txt-file-in-python/)
    c. **Readme**: A `README.md` file that clearly explains: 1- How to compile and run your code. 2- Examples of command-line usage
    d. **Report (PDF)**: The report must be in pdf format. It should include:
        i. Different properties of LAN mentioned in Task 1
        ii. Screenshots showing connectivity information in Task 2
        iii. Output of ping and traceroute commands in Task 3
    e. **Code Documentation**: It must be in PDF format. Use a tool like Sphinx to automatically generate documentation. You can use any other similar tool if

you want.

f. **GIT Log**: Use Git for version control and make commits at appropriate points during development. Submit a git log file showing the commit history. This file should be name `revisions.txt`