TIN ASSIGNMENT 1

Due Date: **29th January 2025 11:59 PM**

10% penalty for each extra day

Steps to follow:

1. Install Virtualbox (or an equivalent hypervisor) on your system. Follow the below link for Virtualbox installation on Linux and Windows machine
    a. Windows : https://www.virtualbox.org/wiki/Downloads
    b. Linux : https://www.virtualbox.org/wiki/Linux_Downloads
2. Download the VM from here and import the VM image using Virtualbox software (username: p4, password: p4)
3. **Packet reflector:** Understand and execute steps described in packet reflector example P4 programs [packet reflector excercise] [packet reflector example]. Goto to p4-tools/ACN-CS5060/p4-learning/exercises/01-Reflector, first try writing a p4 program on your own. After you try, compare your code with the p4 program in the solution folder.
4. **Packet repeater (10 marks):**
    a. Goto to p4-tools/ACN-CS5060/p4-learning/exercises/02-Repeater
    b. Fill the gaps in the “repeater.p4” skeleton. Write code at places marked with a “TODO”. Solve this exercise using two different approaches. Solution 1 using conditional statements and fixed logic. Solution
    c. ve to use a match-action table populated using the CLI.
    d. Instructions to follow: README file
5. **L2 Basic Forwarding (30 marks):**
    a. Goto p4-tools/ACN-CS5060/p4-learning/exercises/03-L2_Basic_forwarding
    b. Implement the L2 basic forwarding. Fill the gaps (marked as TODO) in the “p4src/l2_basic_forwarding.p4” skeleton. Also, create a file called s1-commands.txt with commands to fill your tables. (10)
    c. Implement an Rx and Tx counter using registers that count the packets received and transmitted at each port. Show that the counter increments using the switch CLI. Capture the screenshot showcasing the same and submit it along with the code. (20)
    d. Instruction to follow: Readme file
6. **Equal-Cost Multi-Path (ECMP) Routing (60 marks):**
    a. Goto p4-tools/ACN-CS5060/p4-learning/exercises/05-ECMP
    b. Implement the ECMP logic. Fill the gaps (marked as TODO) in the “p4src/ecmp.p4” skeleton and both the header files inside “p4src/include/headers.p4” and “p4src/include/parsers.p4”. For this assignment, populate the tables as below
        i. please create six files “sX-commands.txt”, one for each switch with commands to fill their tables. (10)

ii. Program the switch tables using an SDN controller. You may refer to example exercise programs (08-Simple_Routing, 09-Traceroutable) for a reference controller program. (40)

c. Implement Tx and Rx port counters at S1 and S6 and list down the colluding flows (flows that take the same path) by observing the Tx and Rx port counters. Highlight the observation in a tabular form. (10)

d. Instruction to follow: Readme file

Flow Id	Path taken

What to submit?

- Put your code in the folders below.
  1. Packet repeater: p4-tools/ACN-CS5060/p4-learning/exercises/02-Repeater
  2. L2 Basic Forwarding: p4-tools/ACN-CS5060/p4-learning/exercises/03-L2_Basic_forwarding
  3. ECMP: p4-tools/ACN-CS5060/p4-learning/exercises/05-ECMP
- A single zip file containing a report with necessary screenshots and observations, and three folders (02-Repeater, 03-L2_Basic_forwarding, 05-ECMP). Each folder should contain *.p4 files, two subfolders (logs and pcap) created while running the p4 program, and all other unmodified scripts (send, receive, json, etc) along with new files if any that you created.

P4 resources:

- P4 tutorial
- BMV2
- The P4-16 specification
- The Portable Switch Architecture (PSA) specification