LAB 05
Manually configure OpenFlow with Mininet

- Objectives
    - Understand how an Openflow switch behaves
    - Understand what an Openflow controller supposes to do to enable communication.

- Dpctl: a command-line utility that sends openflow messages to a switch
    - View switch configuration and capability
    - View flow table entries
    - Add, delete, and modify flow table entries

Use the command line to setup the topology
- $ sudo mn --topo single,3 --mac --switch ovsk --controller remote
    - This creates a simple host with 3 switches, the mac addresses are assigned in a certain way, the switch is an Open vSwitch (software OpenFlow switch), controller is supposed to be at local host with port number 6633.
    - Mininet> net
    - Mininet> h1 ifconfig
    - Mininet> h2 ifconfig
    - The switch can be controlled at tcp:127.0.0.1:6634

- Mininet>pingall
    - This fails as the switch has nothing in its flow table
- Start another window do 'man dpctl' and 'man ovs-dpctl'
- $ dpctl show tcp:127.0.0.1:6634
    - Tcp:127.0.0.1:6634 is the switch port for control
- $dpctl dump-flows tcp:127.0.0.1:6634
    - The flow table is empty

Manually configure the OpenFlow switch with dptcl

- $dpctl add-flow tcp:127.0.0.1:6634 in_port=1,idle_timeout=1000,actions=output:2
- $dpctl add-flow tcp:127.0.0.1:6634 in_port=2,idle_timeout=1000,actions=output:1
    - $dpctl dump-flows tcp:127.0.0.1:6634
    - Mininet> pingall
        - H1 and h2 are now connected.
    - $dpctl dump-flows tcp:127.0.0.1:6634
        - Check the statistics
    - Mininet> s1 dpctl dump-flows tcp:127.0.0.1:6634
    - Continue the exercise to completely install flow table for all hosts.

Try the following:
- $dpctl add-flow tcp:127.0.0.1:6634
  dl_dst=0:0:0:0:0:1,idle_timeout=1000,actions=output:1
- $dpctl add-flow tcp:127.0.0.1:6634
  dl_dst=0:0:0:0:0:2,idle_timeout=1000,actions=output:2
- $dpctl add-flow tcp:127.0.0.1:6634
  dl_dst=0:0:0:0:0:3,idle_timeout=1000,actions=output:3
  - $dpctl dump-flows tcp:127.0.0.1:6634
  - Mininet> pingall

  - Try the following:
  - $dpctl add-flow tcp:127.0.0.1:6634 idle_timeout=1000,actions=flood
  - Mininet> pingall
  - $dpctl add-flow tcp:127.0.0.1:6634
    dl_dst=ff:ff:ff:ff:ff:ff,idle_timeout=1000,actions=flood
- Mininet>pingall
- dpctl del-flows tcp:127:0.0.1:6634
- dpctl dump-flows tcp:127.0.0.1:6634
- $dpctl add-flow tcp:127.0.0.1:6634
  dl_dst=ff:ff:ff:ff:ff:ff,idle_timeout=1000,actions=flood
- $dpctl add-flow tcp:127.0.0.1:6634
  dl_dst=0:0:0:0:0:1,idle_timeout=1000,actions=output:1
- Mininet>pingall
- how to make the ping successful for one pair of hosts?

- Packet Capture: Use Wireshark to capture packets on the Mininet network, focusing on traffic between the OpenFlow switches and controller.

- OpenFlow Packet Structure: Analyse captured packets to identify OpenFlow-specific information. Recognize different OpenFlow message types (like "Packet-In" and "FlowMod").

Submission:

1. Analyse the above OpenFlow packet formats with Wireshark.
2. Include descriptions of different OpenFlow message types.