Experiment No.10
Simulation of software defined network using mininet
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Aim: To simulate a Software Defined Network (SDN) environment using Mininet and observe communication between hosts.

Objective:

To understand the concept of Software Defined Networking

To simulate a virtual network topology using Mininet

To configure and test connectivity between hosts using ping command

To integrate a controller (such as POX/OVS) for centralized control of the SDN

Requirement:

Ubuntu Linux (or VM with Ubuntu installed)

Mininet installed (mininet.org)

Open vSwitch (default in Mininet)
Python support for running Mininet scripts

Theory:

Software Defined Networking (SDN) is a networking paradigm that separates the control plane
from the data plane. In SDN, a central controller manages the flow of traffic in the network, while switches and routers only forward packets based on rules defined by the controller.

Mininet is a popular network emulator that can create a realistic virtual network with hosts, switches, and controllers on a single machine. It allows testing of SDN applications quickly and efficiently.

Key components:

Host: Represents end devices in the network

Switch: Open vSwitch used for packet forwarding

Controller: Centralized controller (like POX, Ryu, ONOS) that manages the network

Link: Virtual connections between hosts, switches, and controllers
Procedure:

Step 1: Launch Mininet
Open a terminal in Ubuntu and run:
sudo mn --topo single,3 --mac --switch ovsk --controller remote
This command creates a simple topology with 1 switch and 3 hosts.
Step 2: Test connectivity
Use the command:
pingall
This sends ICMP packets between all hosts to verify connectivity.

Step 3: Start Mininet CLI
Run commands inside Mininet CLI:
h1 ping h2
h1 ping h3

Step 4: Create custom topology using Python
Create a Python script (topo.py):

```
from mininet.topo import Topo
from mininet.net import Mininet
from mininet.node import RemoteController
from mininet.cli import CLI

class MyTopo(Topo):
def build(self):
h1 = self.addHost('h1')
h2 = self.addHost('h2')
s1 = self.addSwitch('s1')
self.addLink(h1, s1)
self.addLink(h2, s1)

topo = MyTopo()
net = Mininet(topo=topo, controller=RemoteController)
net.start()
CLI(net)
net.stop()
```

Run the script using:

sudo python3 topo.py

Step 5: Attach a controller
Install and run POX controller:
git clone https://github.com/noxrepo/pox.git

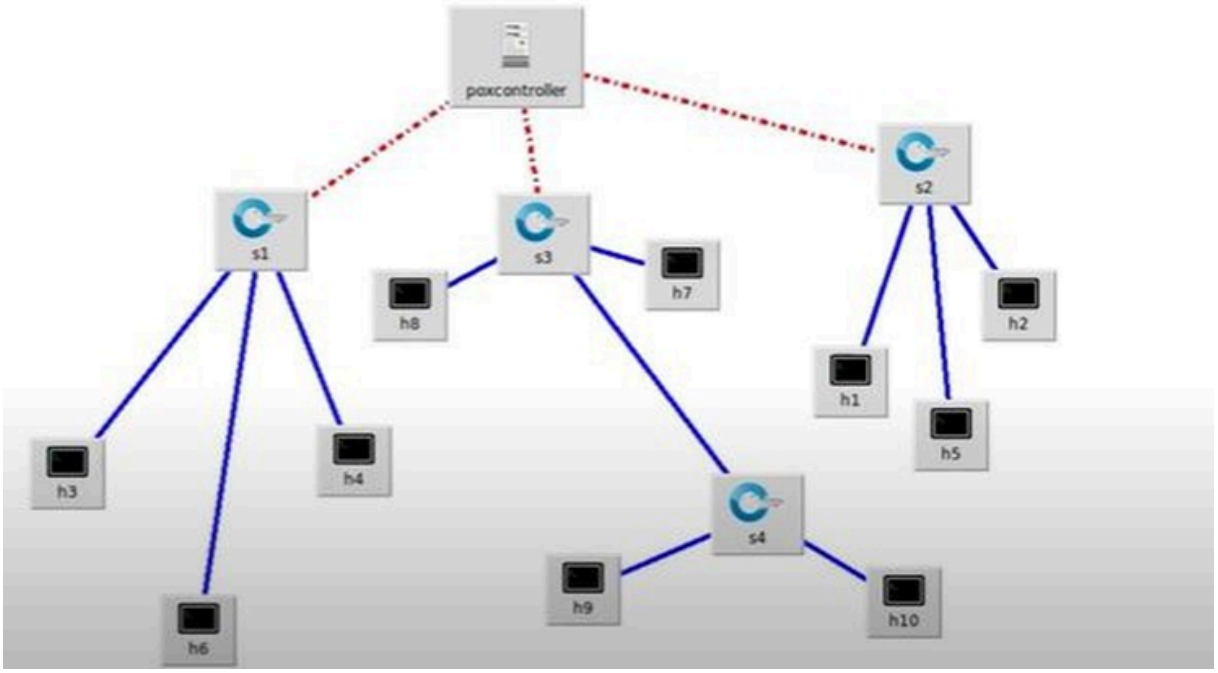
cd pox
./pox.py forwarding.l2_learning

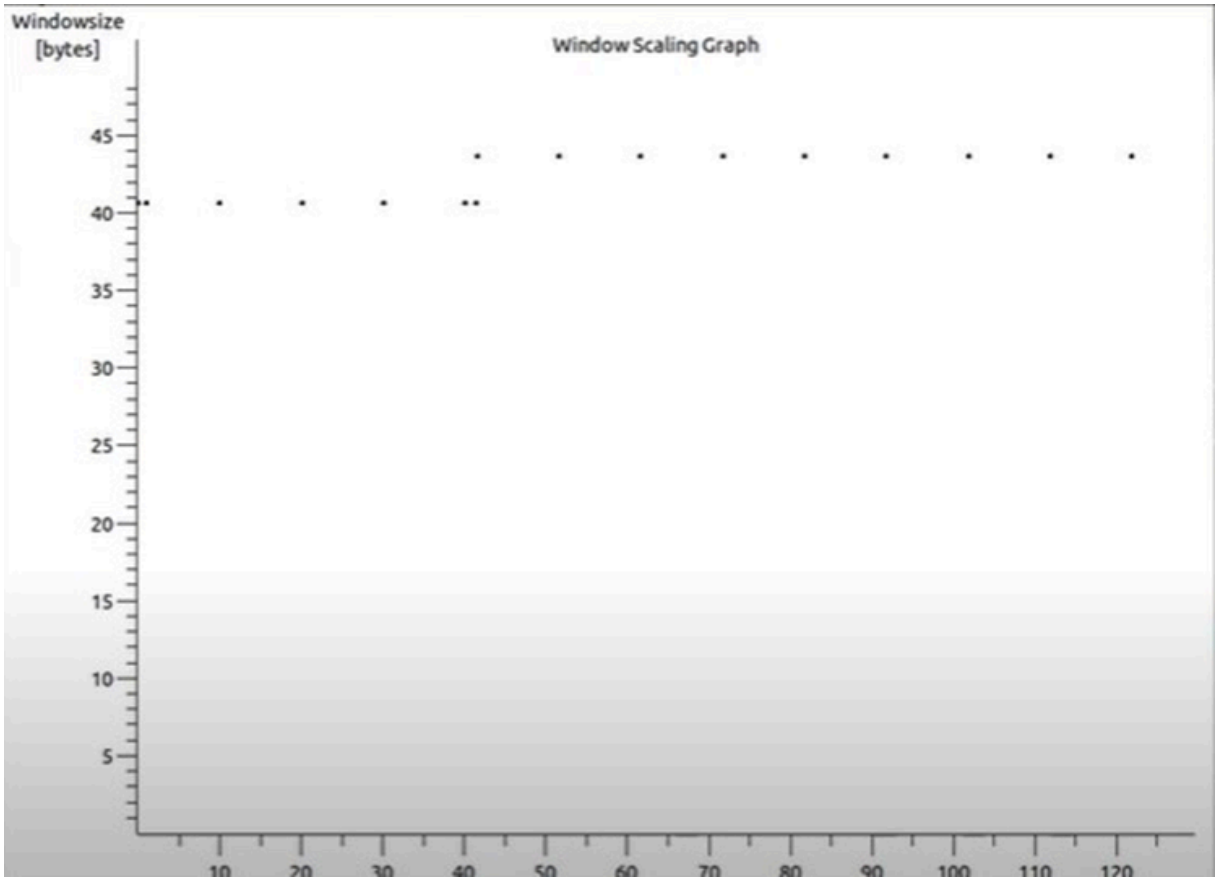
Step 6: Connect Mininet to POX controller
Run Mininet with remote controller option:
sudo mn --controller=remote,ip=127.0.0.1,port=6633

Output:

Pingall shows 100% packet delivery between hosts

Hosts communicate via switch controlled by the SDN controller
Routing and forwarding decisions are handled dynamically by the controller Conclusion:
Simulation of SDN using Mininet demonstrates how networks can be virtualized and centrally managed using controllers. This experiment shows host-to-host connectivity and highlights the role of the controller in defining packet forwarding behavior.





Conclusion -

Simulating Software Defined Networks using Mininet offers a powerful and flexible environment for exploring the potential of SDN. By providing a realistic and scalable platform for testing and development, Mininet facilitates the creation and validation of SDN applications and protocols. Whether for educational purposes, research, or professional development, Mininet enables users to harness the power of SDN to create more dynamic, manageable, and efficient networks. Through hands-on experimentation and simulation, users can gain the skills and insights needed to leverage SDN in real-world networking scenarios.