

LAB 2

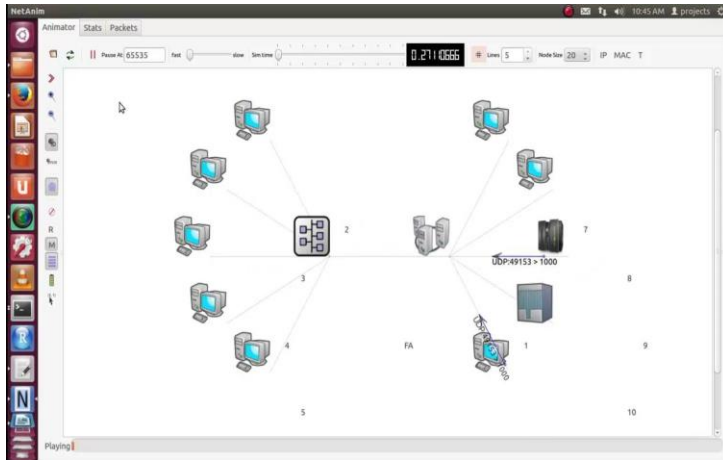
NETWORKING WITH RASPBERRY PI

DATE : 13/08/2025

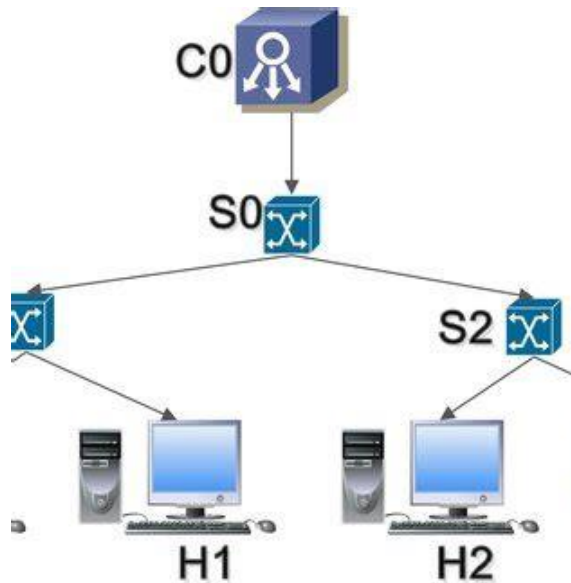
- Install Ubuntu Server and configure RPI to connect to IISc WLAN
- Try ifconfig, iwconfig, ping, dig
- ping to your neighbor host
- netstat –associated options to check the router table
- Wireshark –look at the various packet headers
- traceroute –study the options
- Explore ‘tcpdump’

How to test Networks?

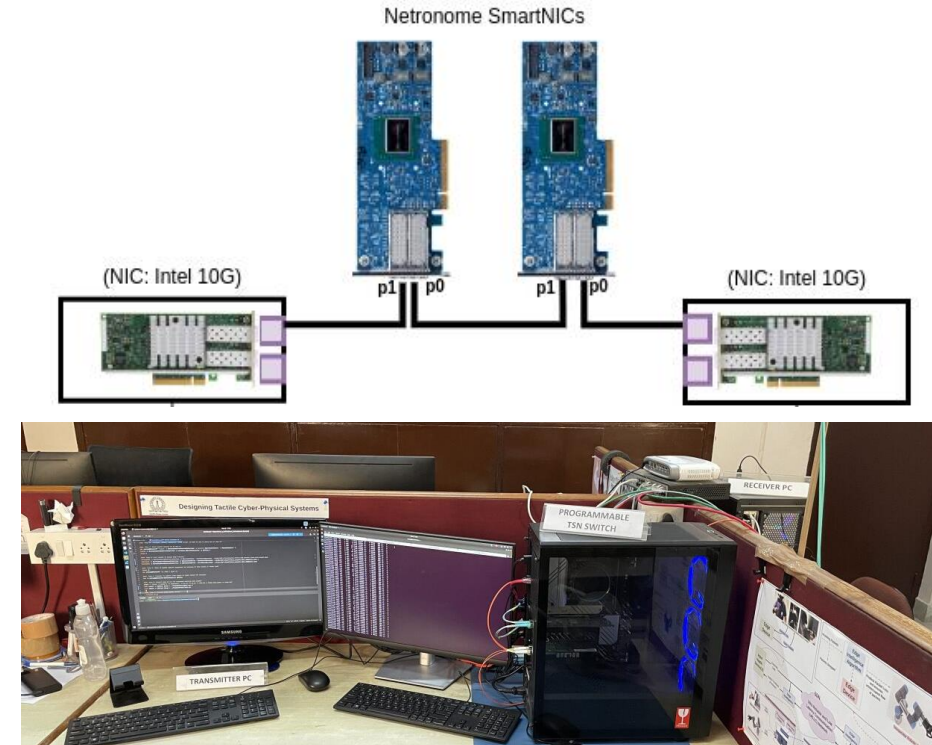
- Network Simulation (*examples: NS3, OMNET++*)
- Network Emulators (*example: Mininet*)
- Hardware Testbed



NS3 Simulator



Mininet



Hardware testbed
(at ZENLab, DESE)

Introduction to Mininet

- Mininet is an open-source network emulator that allows us to create virtual networks on a single machine.
- Think of Mininet to simulate complex network scenarios without needing a physical setup.
- Mininet lets you create virtual hosts, switches, and controllers, mimicking a real network environment.

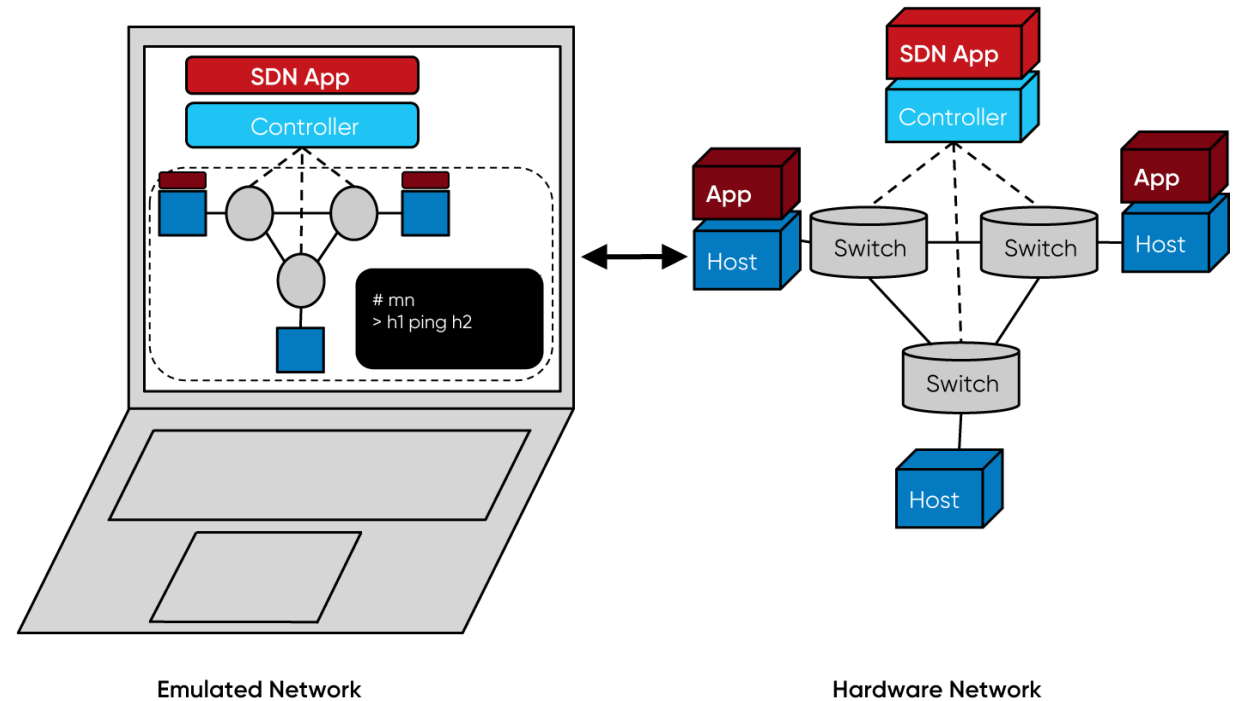
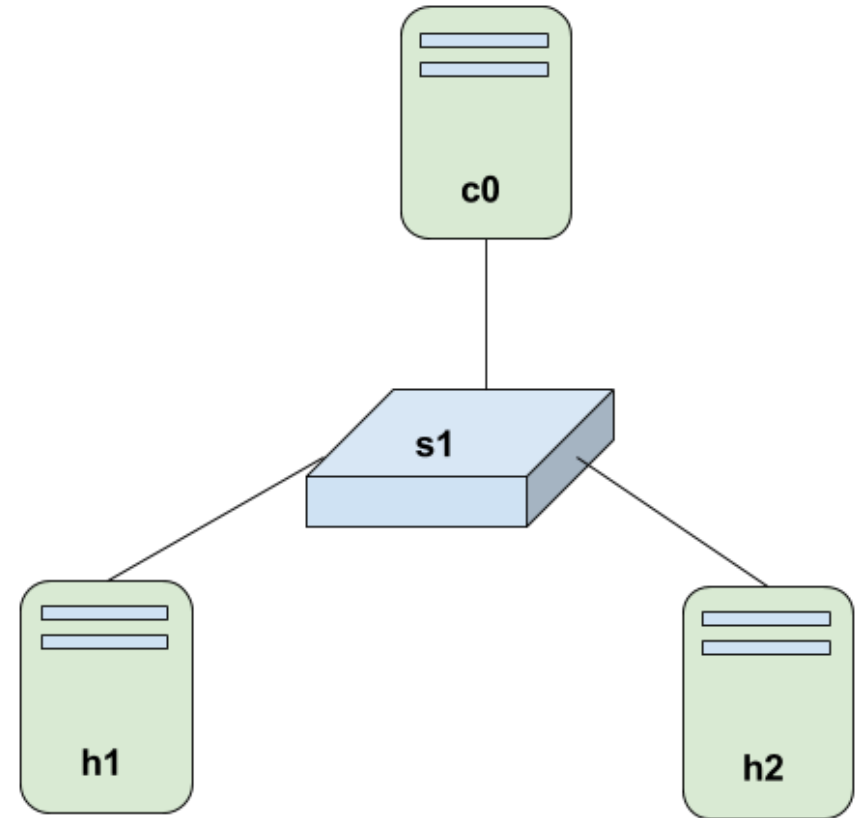


Image Credits: Open Network Foundation (ONF)

Mininet - Network Topology

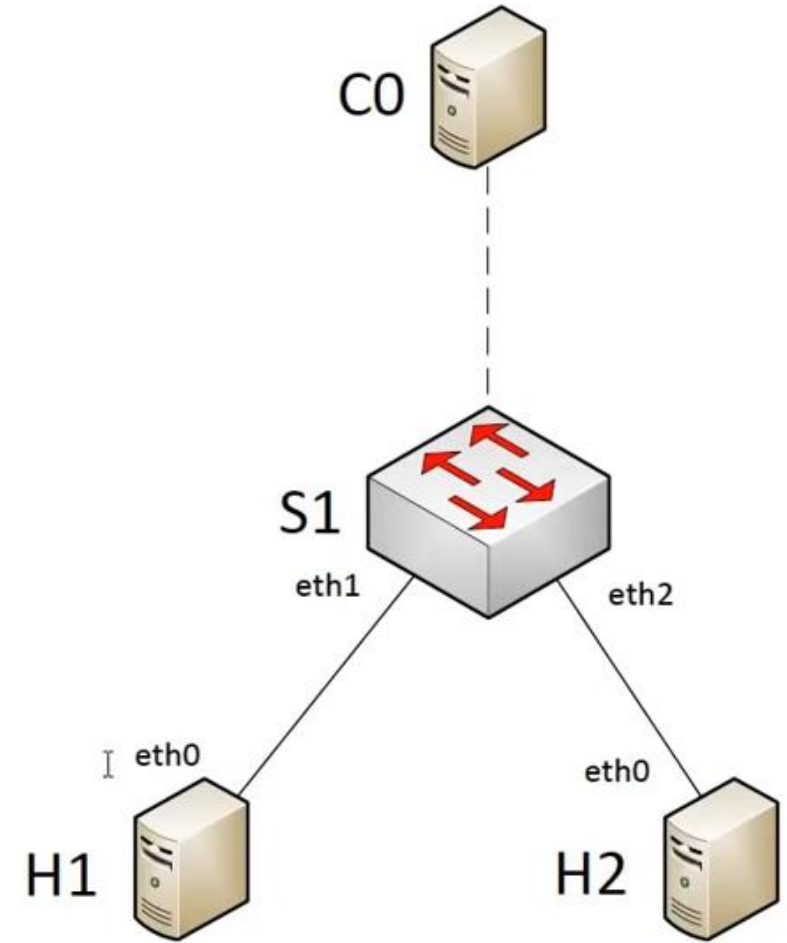
- **Hosts** - These are the end devices that generate or receive network traffic, like computers or servers.
- **Switches** - They forward network traffic between hosts and can be programmed to handle different flows.
- **Controllers** - They manage the behaviour of switches and the flow of data within the network.
- Two ways to create topologies in Mininet:
 - using CLI (command line interface)
 - writing a Python program



Install Mininet VM Image on Oracle Virtual Box

Mininet - Basic Commands

- `sudo mn` – creates a default network topology with 2 hosts, 1 switch and 1 controller
- To get more information about our topology:
 - `nodes`
 - `net`
 - `pingall`
 - `h1 ping h2`
 - `xterm h1`
 - `iperf`
 - `Iperfudp`
 - `py 'hello ' + 'world'`



Default Topology

Hands – on exercises and assignment

Mininet - Different Topologies

- `sudo mn`
`sudo mn --topo minimal`
creates 1 switch, 1 controller and 2 hosts
- `sudo mn --topo linear,4`
creates four hosts, four switches, and one controller (c0).
- `sudo mn --topo single,5`
creates four hosts, one switch, and one controller
- `sudo mn --topo tree, depth=2, fanout=2`
 - *depth: configures the depth of the inner nodes (switches)*
 - *fanout: number of child nodes at each level.*

NETWORKING WITH RASPBERRY PI SUBMISSIONS – Lab1

- Create a dummy interface '<yourname>', get the interface 'up' and add an IP address with the netmask.
- *Ping* your own host, neighbour, a webserver, and a host that is shutdown and note down the ping table and explain every fields
- Use *netstat* to note down the routing table and default route.
- Use *traceroute* to google.co.in with a view to examine the routes to the destination. Attempt to traceroute hosts in the same subnet and to the hosts on a different subnet
- On Mininet connect SRC and DST with separate switches and note down the ping table