

NETWORKS LAB EXPERIMENT - 10

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Simulation:

- Software Prototyping or Imitation of real-world process or system over time.
- Used in Video games, education, training, testing etc.,
- Involves creation of model and implementation of the operation of the system using model

Eg: 1. Flight simulation

2. Autodesk Flow

3. Network Simulation (Cisco Packet) etc.,

Significance of simulators:

When real system is

- Dangerous to Engage
- Being Designed not built (Checking if feasible for deployment).
- Not existing at all.
- Highly expensive.

Simulation vs Emulation:

- Simulation is Imitate, Mimic, Pretend, Give the Appearance of.
- Emulation is Reproduce or Duplicate functions of a system in a way that is functionally identical to the thing being emulated.

Ns-3 Simulator

- Not an extension of ns-2.
- ns-3 is a discrete event network simulator for Internet systems, protocol design and multiple levels of abstractions.
- It's an open-source simulator licensing (GNU GPLv2) and development model.
- Modular, documented core. Programming Languages used are C++ wrapped by Python.

Installation of ns3:

<https://www.nsnam.org/wiki/Installation>

Tutorial : <https://www.nsnam.org/docs/tutorial/html/index.html>

- Look at the screenshots for installing it on Ubuntu 20.04 LTS

Basic Components:

Nodes: ns-3 node as a shell of a complex to which one may add Net devices (cards) and other innards including protocols and applications.

Net Device: Net Device are strongly bound to channels of a matching type.

- Csma Net Device - Ethernet NIC
- Wifi Net Device - Wifi Net Device

Channels:

- Point to Point Channel - PPP link
- Csma Channel - Ethernet link
- Wifi Channel - 802.11 link (Infrastructure & Adhoc)

Application:

- UdpServer, UdpServerHelper UDP-Client - UDP packet with sequence number and Time stamp
- OnOff Application UDP-Server - Receive UDP packets
- BulkSend Application UdpClient, UdpClient Helper

Protocol Stack:

WorkFlow of ns3:

- Create a Node
- Create NetDevice and Channel
- Install NetDevice and Channel to Node
- Create Protocol Stack
- Install Protocol stack on Nodes
- Install Application on Nodes

Main Program Structure:

- Include Header files
- Include namespace
- Enable or disable LOGGING
- Create NODE
- Configure TOPOLOGY HELPER for Nodes
- Setup INTERNET STACK
- Setup APPLICATION
- Run SIMULATION

Animation and Visualization:

1. Flow Monitor

- Detects all flows passing through network
- Stores metrics for analysis such as bit rates, duration, delays, packet sizes, packet loss ratios.

2. Net Anim

- Animate packets over wired-links and wireless links.
- Packet timeline with regex filter on packet metadata.
- Node position statistics with node trajectory plotting (path of a mobile node).
- Print brief packet-metadata on packets

3. Writing and Debugging

- Choosing between python and CPP debugging support.

4. Integrated tools and libraries

- Gnuplot
- Matplotlib