

# Introduction to ns3 simulator

**Sarath Babu**  
Research Scholar



Department of Computer Science & Engineering  
National Institute of Technology Calicut.

March 21, 2022



# Content

---

1 Introduction to Simulation

2 Why Simulators

3 NS3 Simulator

# What is a Simulation

---

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

# Examples : Flight simulation

---



Figure: Cockpit of a jet

# Examples : Autodesk Flow

---



Figure: Simulation of airflow around a vehicle

# Network Simulation

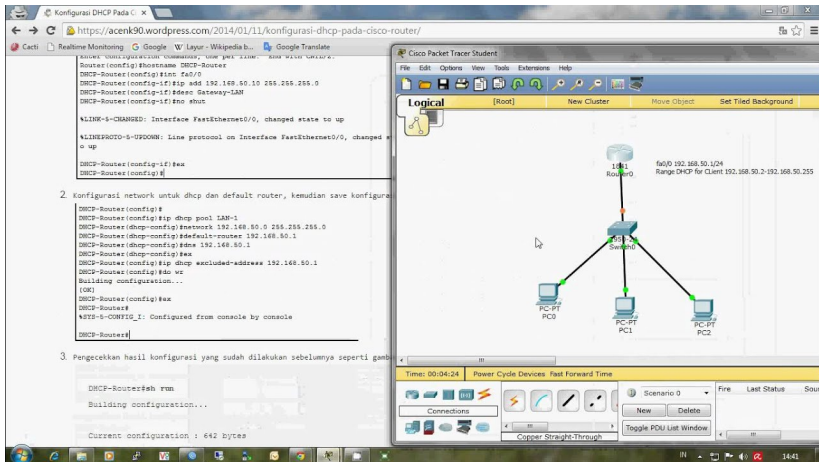


Figure: Packet Tracer

# Significance of Simulators

---

- When the real system is
  - Dangerous to engage
  - Being designed, but not yet built
  - Not existing at all
  - Highly Expensive
- To study the behaviour of the system under different conditions
- To reduce the cost, effort and time wastage in design



- ns-3 is not an extension of ns-2
- ns3 is a discrete-event network simulator for Internet systems, protocol design, and multiple levels of abstractions.
- It is an open-source simulator licensing (GNU GPLv2) and development model.
- Modular, documented core.
- Programming languages used are C++ wrapped by Python.



# Installation of NS3

---

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

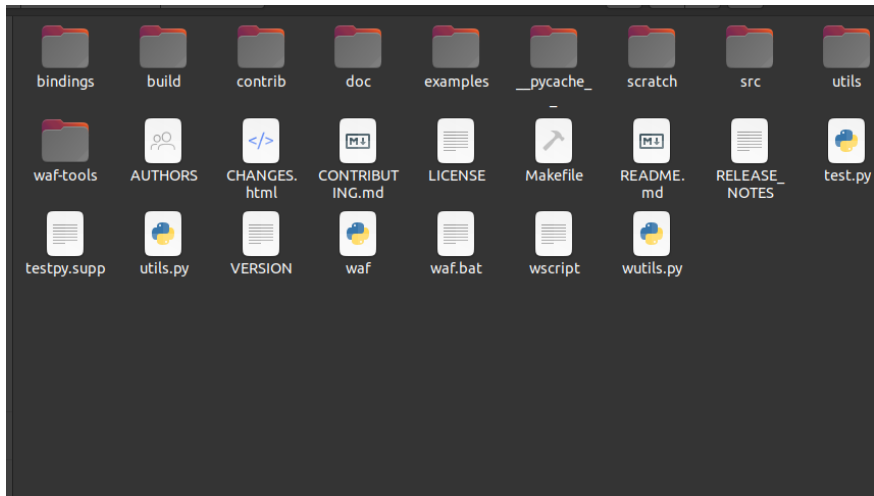
Tutorial : <https://www.nsnam.org/docs/tutorial/html/index.html>

# Versions

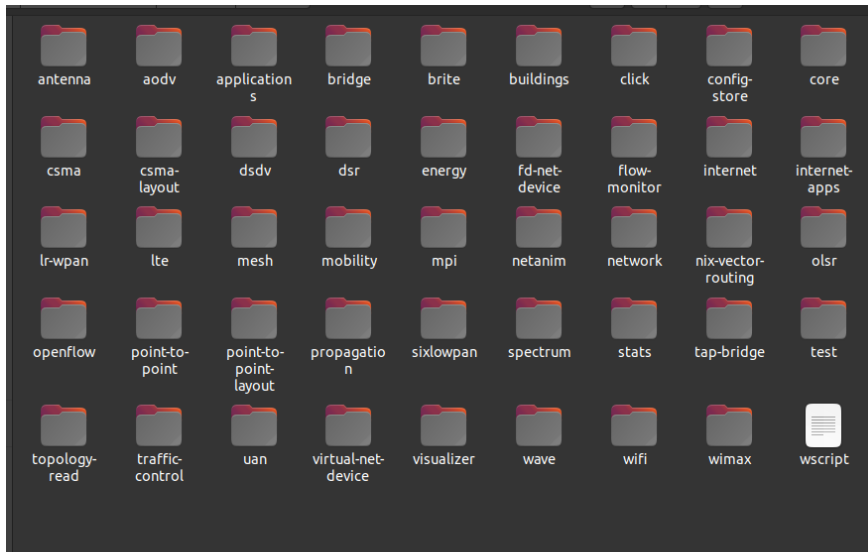
---

		ns-3.34 (July 2021)
ns-3.33 (January 2021)	ns-3.32 (October 2020)	ns-3.31 (June 2020)
ns-3.30 (August 2019)	ns-3.29 (September 2018)	ns-3.28 (March 2018)
ns-3.27 (October 2017)	ns-3.26 (October 2016)	ns-3.25 (March 2016)
ns-3.24 (September 2015)	ns-3.23 (May 2015)	ns-3.22 (February 2015)
ns-3.21 (September 2014)	ns-3.20 (June 2014)	ns-3.19 (December 2013)
ns-3.18 (August 2013)	ns-3.17 (May 2013)	ns-3.16 (December 2012)
ns-3.15 (August 2012)	ns-3.14 (June 2012)	ns-3.13 (December 2011)
ns-3.12 (August 2011)	ns-3.11 (May 2011)	ns-3.10 (January 2011)
ns-3.9 (August 2010)	ns-3.8 (May 2010)	ns-3.7 (January 2010)
ns-3.6 (October 2009)	ns-3.5 (July 2009)	ns-3.4 (April 2009)
ns-3.3 (December 2008)	ns-3.2 (September 2008)	ns-3.1 (July 2008)

# /ns-allinone-3.33/ns-3.33



# /ns-allinone-3.33/ns-3.33/src



# Building ns-3 with build.py

---

- `./build.py`
- Run simulation
- Save it in the scratch folder
- `./waf -run /scratch/first`

# Folder Structure

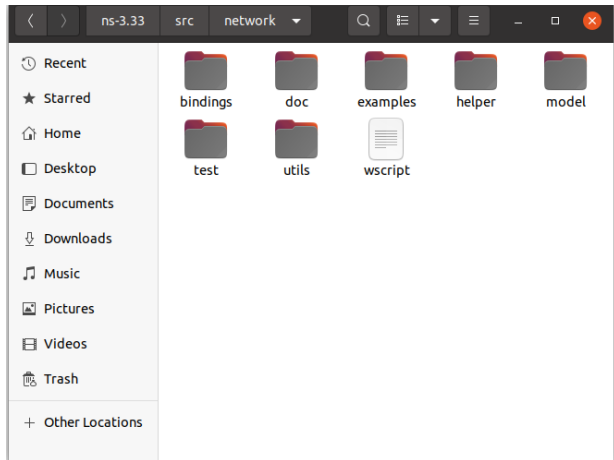
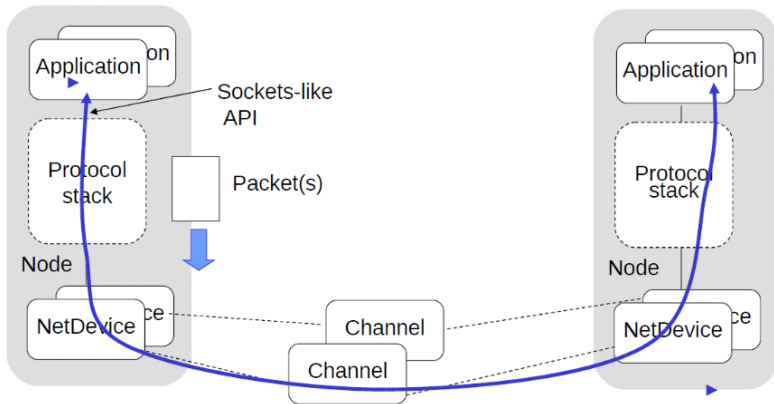


Figure: ns3 folder

- model/ - contains source code for main part of module
- helper/ - contains code for helper classes
- examples/ - contains topology example related to module
- bindings/ - files related to python
- wscript – the “Makefile” equivalent
- doc/ - document API of the module

# Conceptual View of ns3





# Basic Components

---

- Nodes : ns-3 node as a shell of a computer, to which one may add Net Devices (cards) and other innards including the protocols and applications
- Net Device : Net Device are strongly bound to Channels of a matching type Net Devices examples: CsmaNetDevice - Ethernet NIC, WifiNetDevice - Wifi Net Device
- Channels : PointToPointChannel – PPP link, CsmaChannel – Ethernet link, WifiChannel – 802.11 link (Infrastructure and Ad-hoc) and , many more
- Application :
  - UdpServer , UdpServerHelper UDP-Client – UDP packet with seq no and time stamp
  - OnOffApplication Udp-Server – Receive UDP packets
  - BulkSendApplication UdpClient , UdpClientHelper
- Protocol Stack :

# Flow chart

---

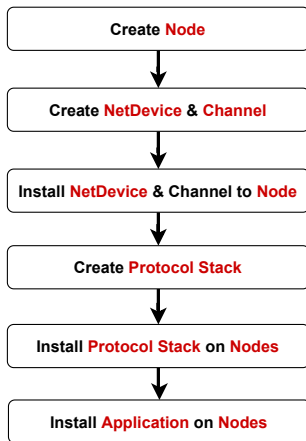



Figure: Work Flow of ns3

# Main Program Structure

---

- Include HEADER files
- Include NAMESPACE
- Enable /disable LOGGING
- Create NODE
- Configure TOPOLOGY HELPER for Nodes
- Set up INTERNET STACK
- Set up APPLICATION
- Run SIMULATION



---

**Thanks for your Attention**