EXPERIMENT-3:

AIM: Explore what is simulation.

DESCRIPTION:

- A computer simulation is an attempt to show real life situation in a virtual way to study how the system works. By changing variables in the simulation, predictions may be made about the behavior of the system. It is a tool to virtually investigate the behavior of the system under study.
- Before virtualization came into the picture, physical simulation was used which was limited in resources and expensive.
- A good example of simulation can be found in the field of network traffic simulation. In such simulations, the model behaviour will change each simulation according to the set of initial parameters assumed for the environment.
- Various advances in network simulation is done such as VINT project
- It is way to model behaviour of network by calculating the communication between various nodes.
- The simulation can be CGI driven or GUI driven.
- Most network simulators use discrete event simulation, in which a list of pending "events" is stored, and those events are processed in order, with some events triggering future events—such as the event of the arrival of a packet at one node triggering the event of the arrival of that packet at a downstream node.

REFERENCES:

- **https://en.wikipedia.org/wiki/Simulation**
- **https://ieeexplore.ieee.org/abstract/document/841785**
- **https://en.wikipedia.org/wiki/Network_simulation**

AIM: Why do we need simulation.

DESCRIPTION:

- Risk-free environment: It provides a platform where one can experiment to their heart's content without worrying about any loses and other risks.
- Save money and time: Simulation is a good way to know who things work without spending a fortune over it.
- Visualization: It helps us validate the things which are learnt in theory and make our understanding better.
- Accuracy : As the simulation is built on a virtual platform, the accuracy or to the point observation can be done which is hard in real life.
- Collaborate: Virtual simulation allows us to collaborate with any person around the world. This can lead to new insight and further growth in research.
- Design: The visualization seen can be taken into account while developing the design for the product.

REFERENCES:

- **https://www.networks.nhs.uk/nhs-networks/focused-on-simulation/why-is-simulation-modelling-needed**
- **https://www.anylogic.com/use-of-simulation/**

AIM: Write about different network simulators.

DESCRIPTION:

- Network simulation has a long history. Ns itself derives from REAL (Realistic and Large),1 which derives from NEST (Network Simulation Testbed).
- Ns and other network simulators use a discrete-event processor as their engine.
- Types:
    - OMNeT++
    - NetSim
    - REAL
    - QualNet
    - J-Sim
    - ns-2/ns-3

REFERENCES:

- **https://ieeexplore.ieee.org/abstract/document/841785**
- **http://ns3simulation.com/list-of-network-simulators/**

AIM: Differences between ns2 and ns3

DESCRIPTION:

- **NS-2:**
  - It uses OTcl as its scripting environment.
  - Recompilation is long process and is prone to failure.
  - Post analysis file formats- .nam for animation , .tr for trace parameters and .xr for xgrah.
  - Can only be used for simulation.
  - ns-2 scripts will not run within ns-3. ns-2 uses OTcl as its scripting environment. ns-3 uses C++ programs or python scripts to define simulations.
- **NS-3:**
  - It uses OOP language such as C++.
  - Recompilation is fast and is done with single command i.e, ./waf .
  - Post analysis file formats- .xml for animation , .tr for trace analysis, .pcap for wireshark analysis and .csv for gnuplot.
  - NS-3 supports coupling, interoperability, good memory management, debugging of split language objects, coding in C++ and object oriented concepts, as well as supports models supported by NS-2 and most suitable for wireless networks.
  - Some ns-2 models that are mostly written in C++ have already been ported to ns-3: OLSR and Error Model were originally written for ns-2. OTcl-based models have not been and will not be ported since this would be equivalent to a complete rewrite.

REFERENCES:

- **https://www.nsnam.org/docs/tutorial/html/introduction.html**
- **http://personal.ee.surrey.ac.uk/Personal/K.Katsaros/ns-3-workshop-part1.html#NS3-Vs-NS2**
- **https://rishikeshteke.wordpress.com/tag/difference-between-ns2-and-ns3/**
- **https://www.nsnam.org/support/faq/ns2-ns3/**
- **https://ns2blogger.blogspot.com/2016/05/ns2-versus-ns3.html**

AIM: Installation of NS3

DESCRIPTION/IMPLEMENTATION:

Step 1

sudo su

```
student@cbit-OptiPlex-3060:~$ sudo su
[sudo] password for student:
Sorry, try again.
[sudo] password for student:
root@cbit-OptiPlex-3060:/home/student# sudo apt-get update
```

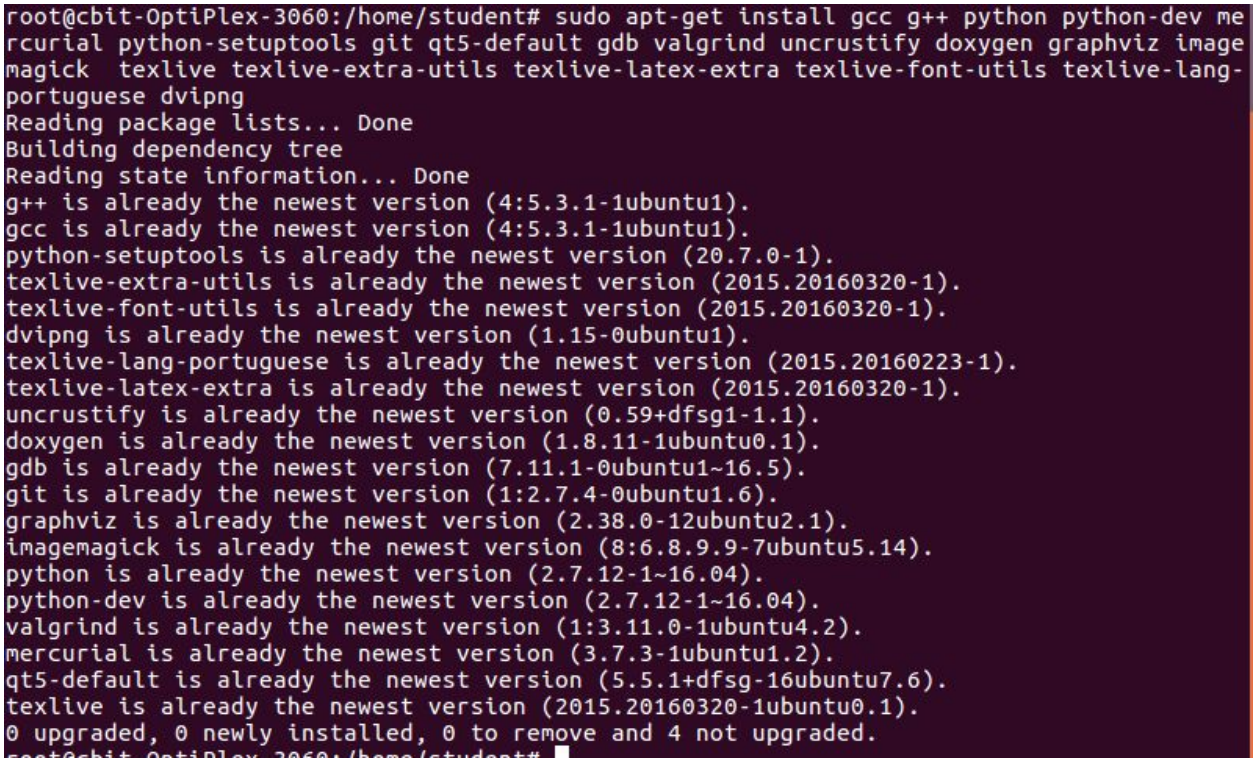
sudo apt-get update

```
root@cbit-OptiPlex-3060:/home/student# sudo apt-get update
Ign:1 http://dl.google.com/linux/chrome/deb stable InRelease
Hit:2 http://dl.google.com/linux/chrome/deb stable Release
Hit:4 http://ppa.launchpad.net/deadsnakes/ppa/ubuntu xenial InRelease
Ign:5 http://dell.archive.canonical.com/updates xenial-dell-bison-elk-cougar InRelease
Get:6 http://security.ubuntu.com/ubuntu xenial-security InRelease [109 kB]
Ign:7 http://dell.archive.canonical.com/updates xenial-dell-service InRelease
Hit:8 http://ppa.launchpad.net/gezakovacs/ppa/ubuntu xenial InRelease
Ign:9 http://dell.archive.canonical.com/updates xenial-dell InRelease
Hit:10 http://archive.ubuntu.com/ubuntu xenial InRelease
Hit:11 http://archive.canonical.com/ubuntu xenial InRelease
Get:12 http://archive.ubuntu.com/ubuntu xenial-updates InRelease [109 kB]
Hit:13 http://dell.archive.canonical.com/updates xenial-dell-bison-elk-cougar Release
Hit:14 http://ppa.launchpad.net/octave/stable/ubuntu xenial InRelease
Hit:15 http://dell.archive.canonical.com/updates xenial-dell-service Release
Hit:17 http://dell.archive.canonical.com/updates xenial-dell Release
Get:19 http://archive.ubuntu.com/ubuntu xenial-backports InRelease [107 kB]
Get:21 http://security.ubuntu.com/ubuntu xenial-security/main amd64 DEP-11 Metadata [73.
8 kB]
Get:22 http://archive.ubuntu.com/ubuntu xenial-updates/main amd64 DEP-11 Metadata [324 k
B]
Get:23 http://security.ubuntu.com/ubuntu xenial-security/main DEP-11 64x64 Icons [77.4 k
B]
```

sudo apt-get upgrade

```
root@cbit-OptiPlex-3060:/home/student# sudo apt-get upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following packages have been kept back:
  google-chrome-stable octave octave-common somerville-meta
0 upgraded, 0 newly installed, 0 to remove and 4 not upgraded.
root@cbit-OptiPlex-3060:/home/student#
```

sudo apt-get install gcc g++ python python-dev mercurial python-setuptools git qt5-default gdb valgrind uncrustify doxygen graphviz imagemagick texlive texlive-extra-utils texlive-latex-extra texlive-font-utils texlive-lang-portuguese dvipng

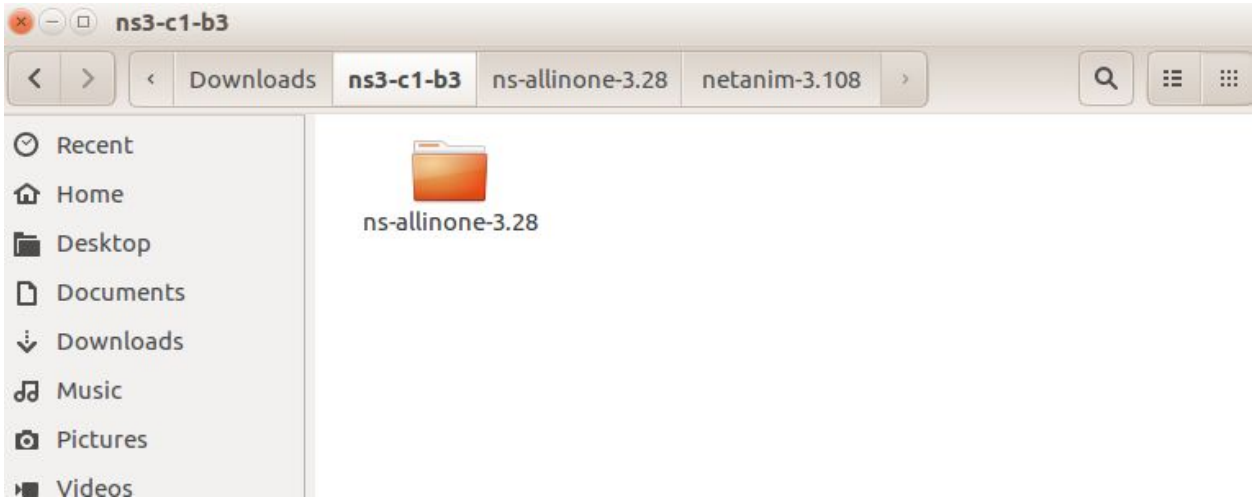


Step 2

--Download ns3.28 extract

- open the below url in browser and download ns allinone 3.28.
  https://www.nsnam.org/ns-3-28/download/
- extract the downloaded file

cd Downloads
create folder ns-c1-b3
mv ns-allinone-3.28.tar.bz2 / ns-c1-b3



Step 3

tar jxvf ns-allinone-3.28.tar.bz2
cd ns-allinone-3.28
sudo ./build.py --enable-examples –enable-tests

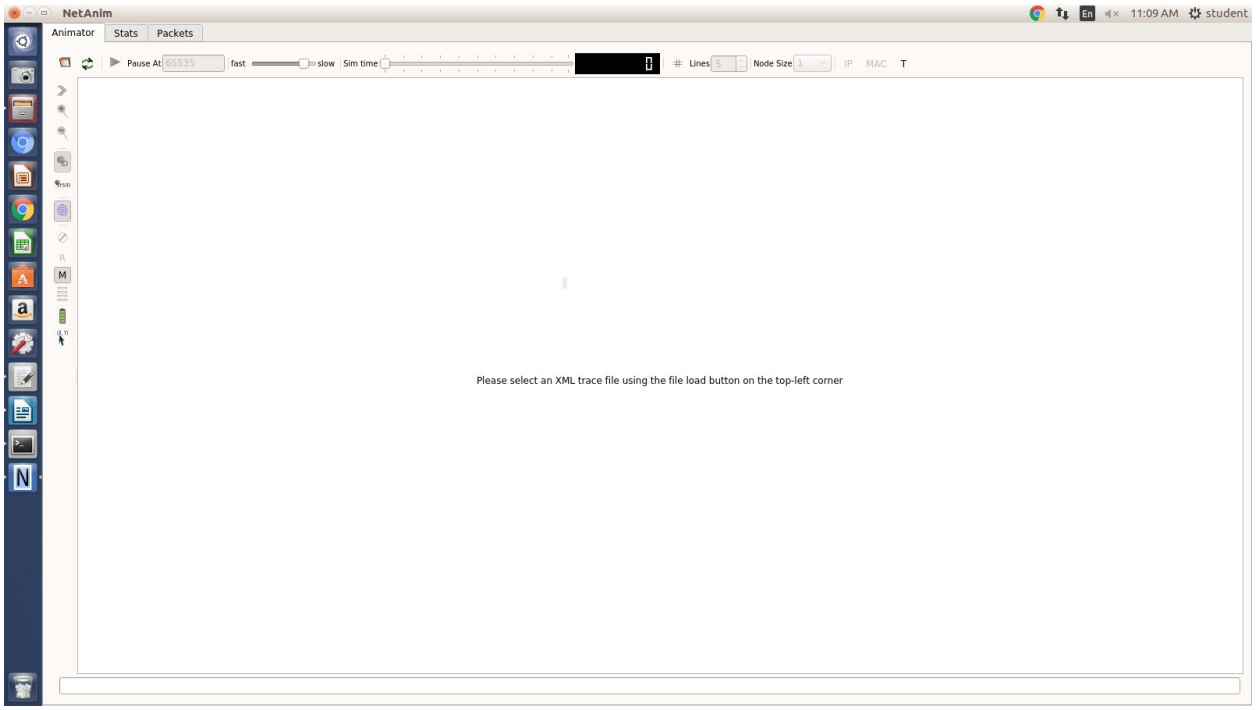
```
root@cbit-OptiPlex-3060:/home/student# cd Downloads
root@cbit-OptiPlex-3060:/home/student/Downloads# cd ns3-c1-b3
root@cbit-OptiPlex-3060:/home/student/Downloads/ns3-c1-b3# cd ns-allinone-3.28
root@cbit-OptiPlex-3060:/home/student/Downloads/ns3-c1-b3/ns-allinone-3.28# sudo ./build.py --enable-examples --enable-tests
# Build NetAnim
Entering directory `netanim-3.108'
 =>  qmake -v
QMake version 3.0
Using Qt version 5.5.1 in /usr/lib/x86_64-linux-gnu
qmake found
 =>  qmake NetAnim.pro
 =>  make
g++ -c -m64 -pipe -O2 -Wall -W -D_REENTRANT -fPIC -DNS3_LOG_ENABLE -DQT_NO_DEBUG -DQT_PRINTSUPPORT_LIB -DQT_WIDGETS_LIB -DQT_GUI_LIB -DQT_CORE_LIB -I. -Iqtpropertybro
src -isystem /usr/include/x86_64-linux-gnu/qt5 -isystem /usr/include/x86_64-linux-gnu/qt5/QtPrintSupport -isystem /usr/include/x86_64-linux-gnu/qt5/QtWidgets -isystem
/include/x86_64-linux-gnu/qt5/QtGui -isystem /usr/include/x86_64-linux-gnu/qt5/QtCore -I. -I/usr/lib/x86_64-linux-gnu/qt5/mkspecs/linux-g++-64 -o main.o main.cpp
g++ -c -m64 -pipe -O2 -Wall -W -D_REENTRANT -fPIC -DNS3_LOG_ENABLE -DQT_NO_DEBUG -DQT_PRINTSUPPORT_LIB -DQT_WIDGETS_LIB -DQT_GUI_LIB -DQT_CORE_LIB -I. -Iqtpropertybro
src -isystem /usr/include/x86_64-linux-gnu/qt5 -isystem /usr/include/x86_64-linux-gnu/qt5/QtPrintSupport -isystem /usr/include/x86_64-linux-gnu/qt5/QtWidgets -isystem
/include/x86_64-linux-gnu/qt5/QtGui -isystem /usr/include/x86_64-linux-gnu/qt5/QtCore -I. -I/usr/lib/x86_64-linux-gnu/qt5/mkspecs/linux-g++-64 -o log.o log.cpp
g++ -c -m64 -pipe -O2 -Wall -W -D_REENTRANT -fPIC -DNS3_LOG_ENABLE -DQT_NO_DEBUG -DQT_PRINTSUPPORT_LIB -DQT_WIDGETS_LIB -DQT_GUI_LIB -DQT_CORE_LIB -I. -Iqtpropertybro
src -isystem /usr/include/x86_64-linux-gnu/qt5 -isystem /usr/include/x86_64-linux-gnu/qt5/QtPrintSupport -isystem /usr/include/x86_64-linux-gnu/qt5/QtWidgets -isystem
/include/x86_64-linux-gnu/qt5/QtGui -isystem /usr/include/x86_64-linux-gnu/qt5/QtCore -I. -I/usr/lib/x86_64-linux-gnu/qt5/mkspecs/linux-g++-64 -o fatal-error.o fatal-
.cpp
g++ -c -m64 -pipe -O2 -Wall -W -D_REENTRANT -fPIC -DNS3_LOG_ENABLE -DQT_NO_DEBUG -DQT_PRINTSUPPORT_LIB -DQT_WIDGETS_LIB -DQT_GUI_LIB -DQT_CORE_LIB -I. -Iqtpropertybro
src -isystem /usr/include/x86_64-linux-gnu/qt5 -isystem /usr/include/x86_64-linux-gnu/qt5/QtPrintSupport -isystem /usr/include/x86_64-linux-gnu/qt5/QtWidgets -isystem
/include/x86_64-linux-gnu/qt5/QtGui -isystem /usr/include/x86_64-linux-gnu/qt5/QtCore -I. -I/usr/lib/x86_64-linux-gnu/qt5/mkspecs/linux-g++-64 -o fatal-impl.o fatal-i
pp
g++ -c -m64 -pipe -O2 -Wall -W -D_REENTRANT -fPIC -DNS3_LOG_ENABLE -DQT_NO_DEBUG -DQT_PRINTSUPPORT_LIB -DQT_WIDGETS_LIB -DQT_GUI_LIB -DQT_CORE_LIB -I. -Iqtpropertybro
src -isystem /usr/include/x86_64-linux-gnu/qt5 -isystem /usr/include/x86_64-linux-gnu/qt5/QtPrintSupport -isystem /usr/include/x86_64-linux-gnu/qt5/QtWidgets -isystem
/include/x86_64-linux-gnu/qt5/QtGui -isystem /usr/include/x86_64-linux-gnu/qt5/QtCore -I. -I/usr/lib/x86_64-linux-gnu/qt5/mkspecs/linux-g++-64 -o loggt.o loggt.cpp
g++ -c -m64 -pipe -O2 -Wall -W -D_REENTRANT -fPIC -DNS3_LOG_ENABLE -DQT_NO_DEBUG -DQT_PRINTSUPPORT_LIB -DQT_WIDGETS_LIB -DQT_GUI_LIB -DQT_CORE_LIB -I. -Iqtpropertybro
src -isystem /usr/include/x86_64-linux-gnu/qt5 -isystem /usr/include/x86_64-linux-gnu/qt5/QtPrintSupport -isystem /usr/include/x86_64-linux-gnu/qt5/QtWidgets -isystem
/include/x86_64-linux-gnu/qt5/QtGui -isystem /usr/include/x86_64-linux-gnu/qt5/QtCore -I. -I/usr/lib/x86_64-linux-gnu/qt5/mkspecs/linux-g++-64 -o resizeableitem.o res
leitem.cpp
g++ -c -m64 -pipe -O2 -Wall -W -D_REENTRANT -fPIC -DNS3_LOG_ENABLE -DQT_NO_DEBUG -DQT_PRINTSUPPORT_LIB -DQT_WIDGETS_LIB -DQT_GUI_LIB -DQT_CORE_LIB -I. -Iqtpropertybro
```

Step 4

cd ns-3.28
./waf --run examples/wireless/mixed-wired-wireless
or
./waf --run examples/energy/energy-model-example

cd..
cd netanim3.108
./NetAnim
Open .xml file and animation is started.

```
root@cbit-OptiPlex-3060:/home/student/Downloads/ns3-c1-b3/ns-allinone-3.28/netanim-3.108
# ./NetAnim
```



REFERENCES:

- https://www.nsnam.org/docs/release/3.1/tutorial.pdf
- https://www.nsnam.org/wiki/Installation#Installation