School of
Applied Computing

Emerging Network Technologies

NetSim

Exercise 1

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1. Introduction to NetSim

1.1 Introduction to network simulation through the NetSim simulation package

1.1.1 Theory:

- **What is NetSim?**

NetSim is a network simulation tool that allows you to create network scenarios, model traffic, and study performance metrics.

- **What is a network?**

A network is a set of hardware devices connected together, either physically or logically. This allows them to exchange information.

A network is a system that provides its users with unique capabilities, above and beyond what the individual machines and their software applications can provide.

- **What is simulation?**

A simulation is the imitation of the operation of a real-world process or system over time.

Network simulation is a technique where a program models the behavior of a network either by calculating the interaction between the different network entities (hosts/routers, data links, packets, etc) using mathematical formulae, or actually capturing and playing back observations from a production network. The behavior of the network and the various applications and services it supports can then be observed in a test lab; various attributes of the environment can also be modified in a controlled manner to assess how the network would behave under different conditions.

- **What does NetSim provide?**

Simulation: NetSim provides simulation of various protocols working in various networks as follows: **Internetworks, Legacy Networks**, **BGP Networks, Advanced Wireless Networks, Cellular Networks, Wireless Sensor Networks, Personal Area Networks, LTE/LTE-A Networks, Cognitive Radio Networks, and Internet of Things**. Users can open the experiments and save the experiments as desired. The different experiments can also be analyzed using the analytics option in the simulation menu.

Programming: NetSim covers various programming exercises along with concepts, algorithms, pseudo code and flowcharts. Users can also write their own source codes in C/C++ and can link them to NetSim.

Some of the programming concepts are Address resolution protocol (ARP), Classless inter domain routing (CIDR), Cryptography, Distance vector routing, shortest path, Subnetting etc.

1.2 Starting NetSim

1.2.1: Double click on the desktop icon to start NetSim; figure 1 show what the icon looks like.

Figure 1: Netsim desktop icon

1.2.2: Figure 2 shows the loading of the NetSim validation screen, once you double click on the above icon.

Figure 2: NetSim validation screen

1.2.3: Figure 3 shows the NeSim welcome screen and menu at the top left.

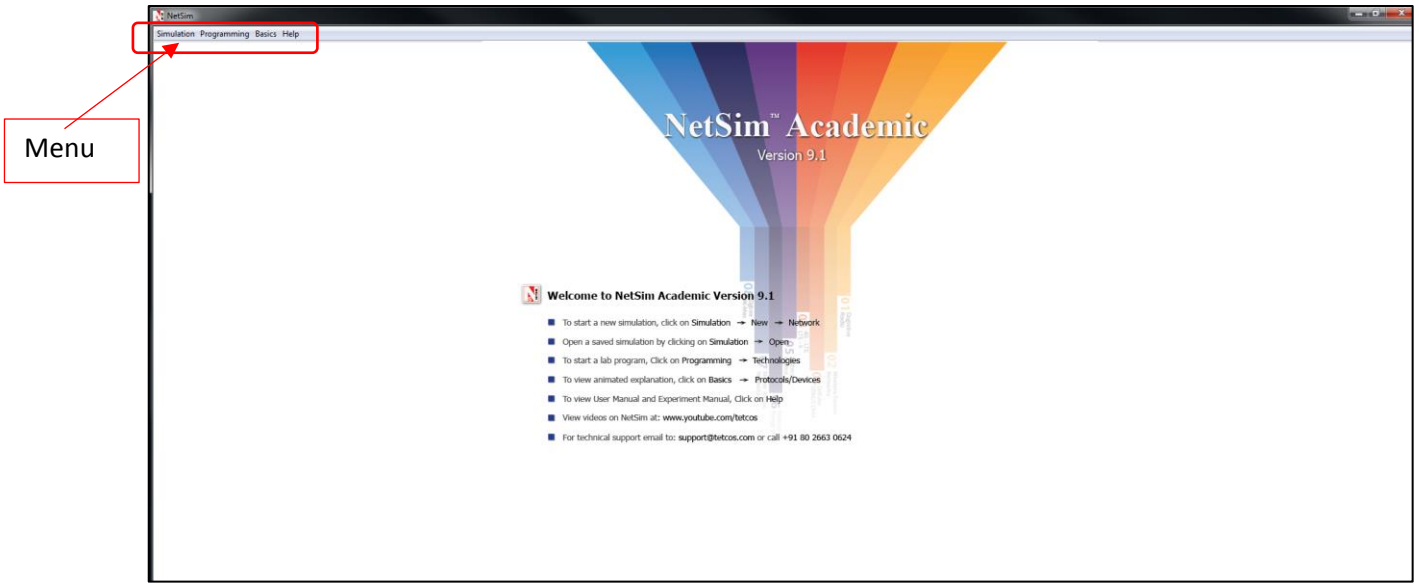


Figure 3: NetSim welcome screen

1.2.4: Figure 4 shows NetSim work environment; this is where you construct your network design.

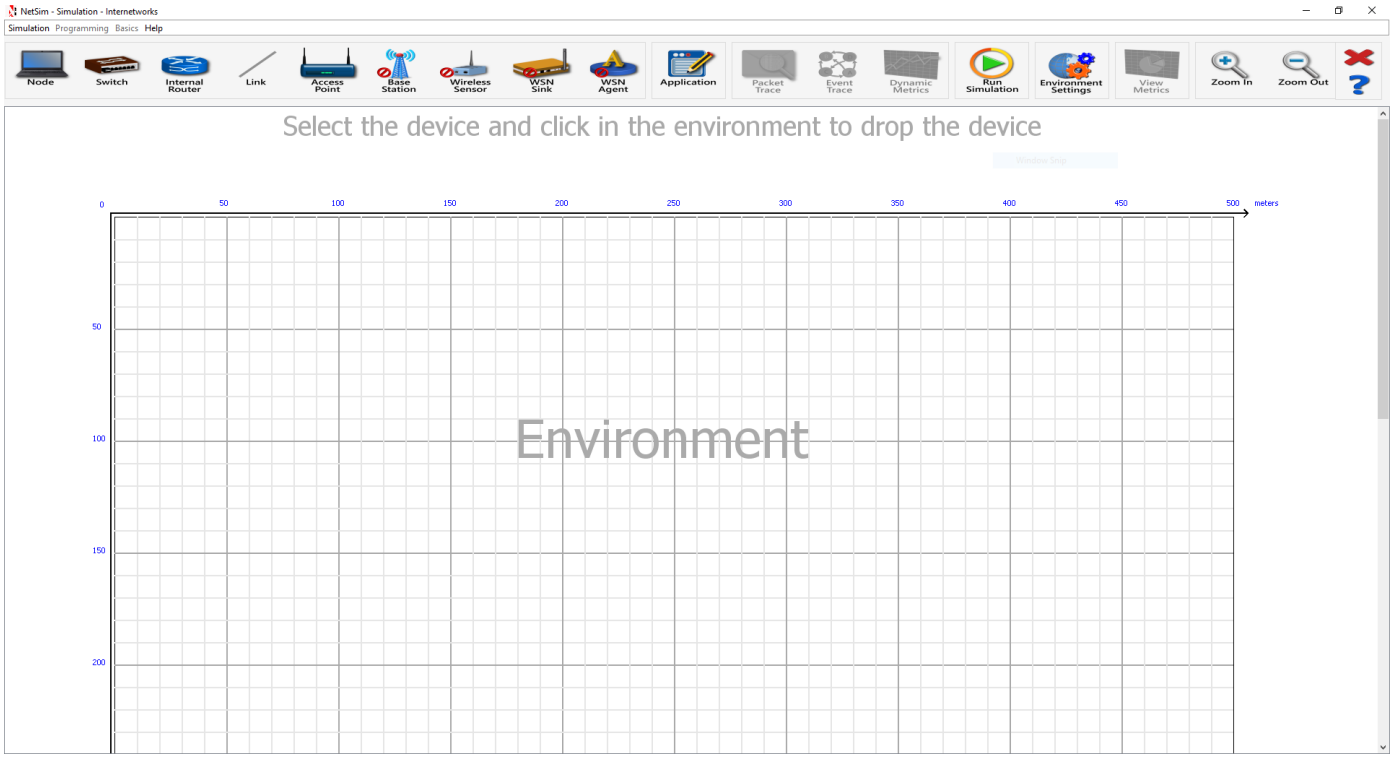


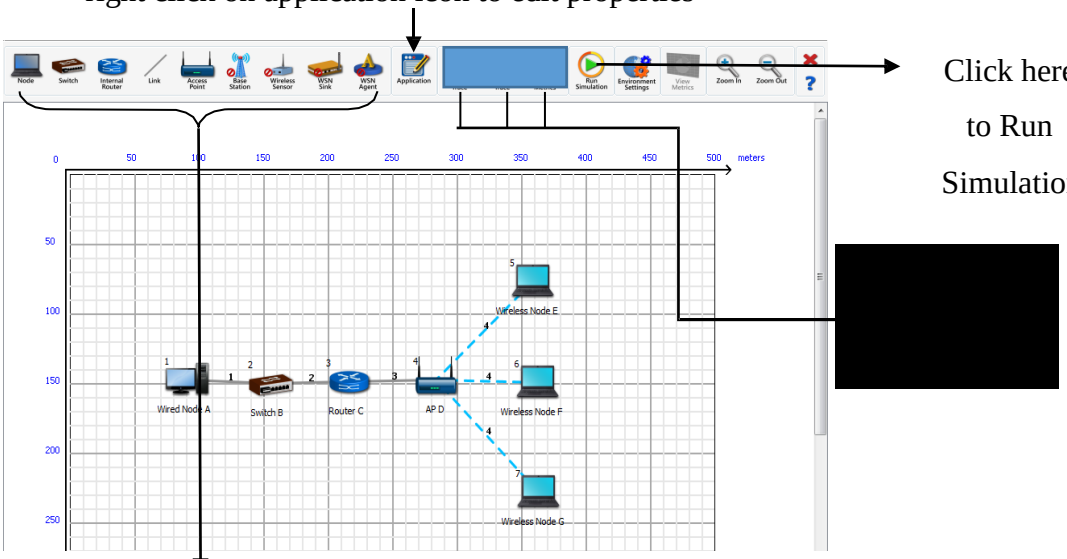
Figure 4: NetSim work environment

1.3 Design and configure a simple network model, collect statistics and analyze network performance.

1.3.1 Theory:

- **Network model:** A Network model is a flexible way of representing devices and their relationships. Networking devices like hubs, switches, routers, nodes, connecting wires etc. are used to create a network model.

Click here to drop the application icon to generate traffic. Then right click on application icon to edit properties



Click here to Run Simulation

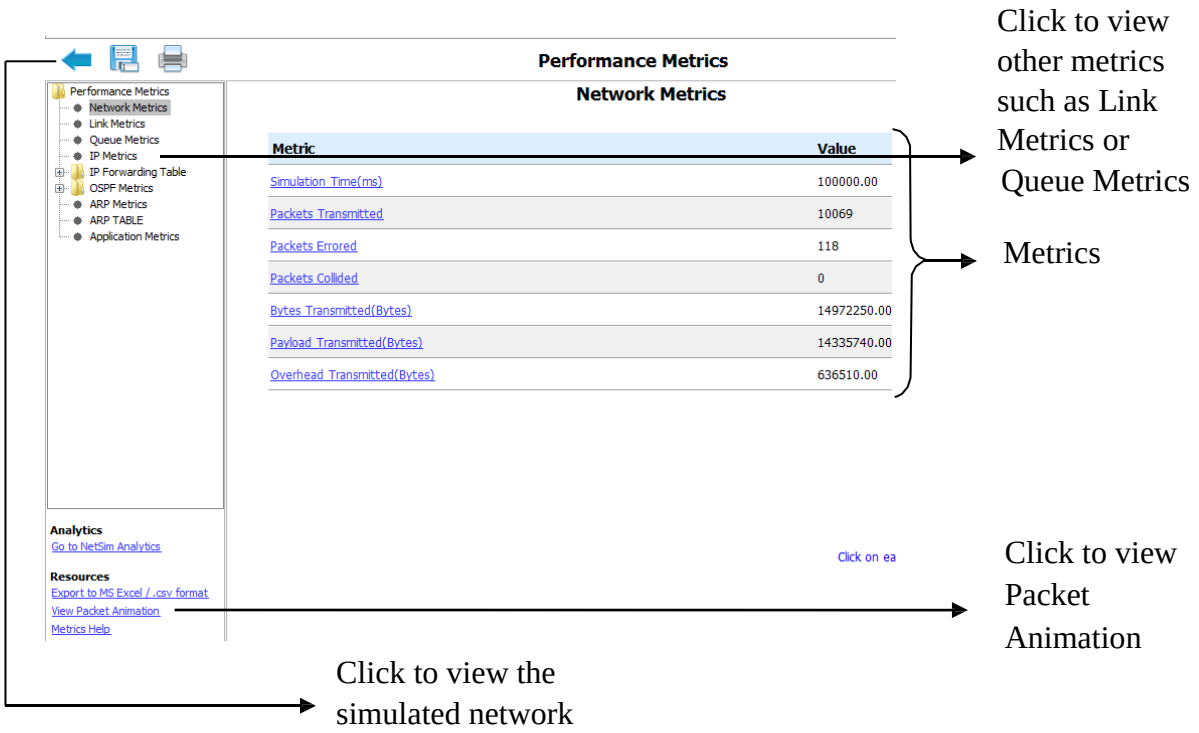
Click and drop network devices and right click to edit properties

- **Scenario:** A Scenario is a narrative describing foreseeable interactions of types of input data and its respective output data in the system.

- **Network performance:** To measure the performance of a network, performance metrics constitutes of Network Statistics.

- **What are network statistics?**

  Network statistics are network performance related **metrics** displayed after simulating a network. The report at the end of the completion of a simulation experiment include metrics like throughput, simulation time, frames generated, frames dropped, frames errored, collision counts etc, and their respective values.

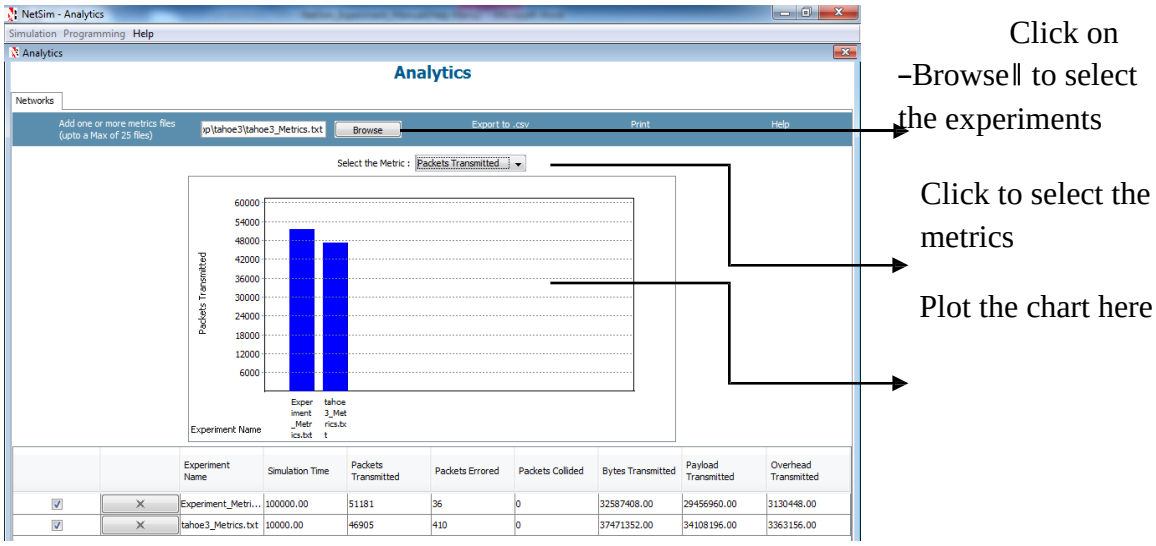
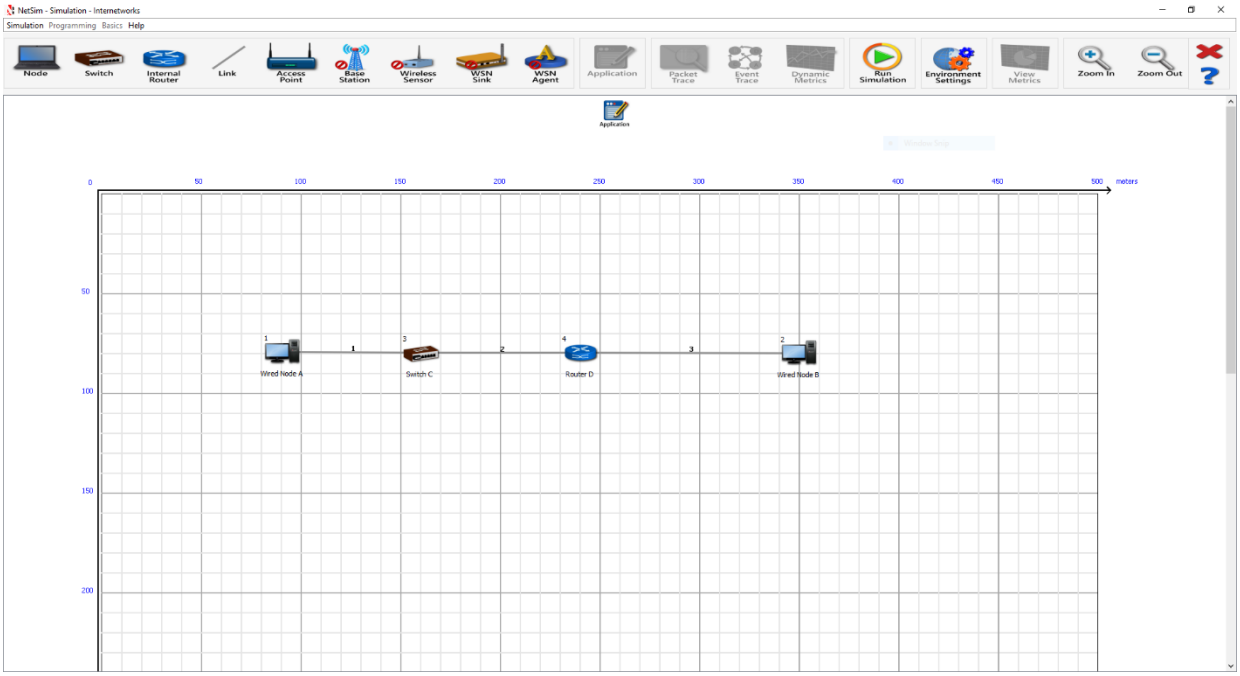


- **What is Packet Animation?**

  When running simulation, options are available to play and record animations which allow users to watch traffic flow through the network for in-depth visualization and analysis.

- **What is NetSim analytics used for?**

  It is used to compare and analyze various protocols scenarios under **Internetworks, Legacy Networks**, **BGP Networks, Advanced Wireless Networks – MANET and Wi- Max, Cellular Networks, Wireless Sensor Networks, Zigbee Networks, Internet of Things, LTE/LTE-A Networks** and **Cognitive Radio Networks**. Parameters like utilization, loss, queuing delay, transmission time etc of different sample experiments are compared with help of graphs.



1.4: Use the demonstrations above to design the below model, run some statistics of your choice and try to analyse the graphical output of your statistics.