Beyond Syllabys Practical Study of Network Simulator

Network Simulation:

Introduction:

A network simulator is software that predicts the behaviour of a computer network. Since communication Networks have become too complex for traditional analytical methods to provide an accurate understanding of system behaviour, network simulators are used. In simulators, the computer network is modelled with devices, links, applications etc. and the performance is analysed. Simulators come with support for the most popular technologies and networks in use today such as Wireless LANs, Mobile Adhoc Networks, Wireless Sensor Networks, Vehicular Adhoc Networks, Cognitive Radio networks, LTE / LTE- 5G, Internet of things (IOT) etc.

Simulations:

Most of the commercial simulators are GUI driven, while some network simulators are CLI driven. The network model / configuration describes the network (nodes, routers, switches, links) and the events (data transmissions, packet error etc.). Output results would include network level metrics, link metrics, device metrics etc. Further, drill down in terms of simulations trace files would also be available. Trace files log every packet, every event that occurred in the simulation and are used for analysis. 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.

List of network simulators:

There are both free/open-source and proprietary network simulators available. Examples of notable network simulators / emulators include:OPNET,TETCOSNetSim

Both commercial tools are available at deeply discounted prices to universities for network lab experimentation and network R & D

POPULAR SIMULATORS Many simulators exist, some of them are: GloMoSim/QualNet, OPNET, NS-2, NS-3 and OMNeT++ .

1. GloMoSim :
   This is a public domain simulator developed by UCLA (UCLA Computer Science Department is well known for its research) . The authors state that it is being designed using the parallel discrete-event

simulation capability provided by Parsec, which is a C-based simulation language, developed by the Parallel Computing Laboratory at UCLA, for sequential and parallel execution of discrete-event simulation models. GloMoSim currently supports protocols for purely wireless networks. It is built using a layered approach that is similar to the OSI seven layers network architecture. Standard APIs (Applied Programming Interface) are used between the different simulation layers, to allow integration of models developed at different layers by different people. GloMoSim has drifted away from creating each of the OSI layers as a separate entity to representing each node as a single entity, with each layer being represented only by standard APIs to initialize, finalize etc. They claim that this not only allows sharing of memory areas that all OSI layers need to access (viz CPU), but also allows for better performance, scalability and ease of programming use. GloMoSim is thus perceived to be modular, easy to use and flexible, besides maintaining a high degree of detail. GloMoSim needs the Parsec compiler, and coding knowledge of C and Parsec (to a lower extent). Qualnet is the commercial flavor of GloMoSim, and has additional implementations of layers/modules and features like GUI based analysis tools.

2. Qualnet :
   A graphical scenario design and visualization tool. In Design mode, you can set up terrain, network connections, subnets, mobility patterns of wireless users, and other functional parameters of network nodes. You can create network models by using intuitive, click and drag operations. You can also customize the protocol stack of any of the nodes. You can also specify the application layer traffic and services that run on the network. In Visualize mode, you can perform in-depth visualization and analysis of a network scenario designed in Design mode. As simulations are running, users can watch packets at various layers flow through the network and view dynamic graphs of critical performance metrics. Real-time statistics are also an option, where you can view dynamic graphs while a network scenario simulation is running

Uses of network simulators /emulators:

- Network simulators provide a cost-effective method for Network design validation for enterprises / data centres /sensor networks etc.
- Network R & D (More than 70% of all Network Research paper reference a network simulator)[citation needed]

- Defence applications such as HF / UHF / VHF Radio based MANET networks, Naval communications, Tactical data links etc.
- Education - Lab experimentation. Most universities use a network simulation to teach / experiment on networking since it’s too expensive to buy hardware equipment
- There are a wide variety of network simulators, ranging from the very simple to the very complex. Minimally, a network simulator must enable a user to Model the network topology specifying the nodes on the network and the links between those nodes
- Model the application flow (traffic) between the nodes
- Providing network performance metrics as output
- Visualization of the packet flow
- Technology / protocol evaluation and device designs
- Logging of packet/events for drill down analyses / debugging