



An Overview: Basic Concept of Network Simulation Tools

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Abstract: This context represents with network simulation with tools. The network simulation tools are a modern technology. The simulator helps the user to develop the networks with real time. It is useful to test new networking protocols or changes in the existing protocols. The network simulator have different type of tools such as OPNET, QualNet, NS₂, NS₃, OMNET++, NetSim, REAL, J-sim, GloMosim. In this article represent with type of network simulator, advantages and disadvantages, and basic architecture of network simulator tools. It is easy to understand for the users.

Keywords: Opnet, Qualnet, Ns2, Ns3, Omnet++, Netsim, J-sim, Glomosim.

I. INTRODUCTION

Network simulation covers a wide range of various concepts. Although, there exists two of network devices and equipment to simulate a network with real data the network simulation software is to test the end to end application behavior on different network designs^[1]. Over the network simulation is finished completely in software. The other network simulation is to test application performance with real data. Still it is more exact to call genuine data testing as network emulation the majority of people still pass on it as network simulation.

II. NETWORK SIMULATOR

A Network simulator is software that predicts the behavior of a computer network. The communication Networks have become too difficult for traditional analytical methods to provide an exact understanding of system manners, network simulators are used^[10]. In simulators, the computer network is usually modeled with devices, links, applications etc. and the concert is analyzed. Simulators usually come with support for the most popular technologies and networks in use today.

III. TYPE OF NETWORK SIMULATORS

Various types of network simulators can be categorized and explained based on some criteria such as if they are commercial or free, or if they are simple ones or complex ones.

Network simulators :

Commercial: OPNET, QualNet

Open source: NS2, NS3, OMNET++, J-SIM

3.1 OPNET

OPNET (Optimized Network Engineering Tool) simulator is a tool to simulate the behavior and performance of any type of network. The main variation with other simulators lies in its power and flexibility. This simulator makes potential working with OSI model, from layer 7 to the alteration of the most essential physical parameters^[9]. This simulation is developed by OPNET Technologies. Since OPNET is a commercial software. The main programming language in OPNET is C & C++.

Advantages:

- Fast discrete event simulation engine
- Set of element library with source code
- Object-oriented modeling
- Hierarchical modeling environment
- Scalable wireless simulations support
- Customizable wireless modeling
- Discrete Event, Hybrid, and Analytical simulation
- Grid computing support

Disadvantages:

- Complex GUI operation.
- It does not permit a set of nodes within a single connected device.
- Exactness of results is limited by the sample resolution.
- Simulation is incompetent if nothing happens for long periods.



3.2 QualNet

It is a saleable version of Glomosim used by scalable Network Technologies for security projects. It is an ultra high – fidelity network simulation software that predicts wireless and wired mixed stage network and networking device performance^[4]. A simulator for large, heterogeneous networks and the distributed applications that execute on such networks.

Advantages:

- Support with multiprocessor system.
- Relative performance evaluation of alternative
- Built –in measurements on each layer
- Modular, layered stack design
- Standard API for work of protocols across different layers
- Scalability via sustain for parallel execution
- GUI tools used for system/protocol modeling

Disadvantages:

- QualNet is a development of Glomo which is being commercialized.
- Setting up of QualNet on Linux is difficult
- A java based user interface provided by this simulation software is slow

IV. NS2 (Network Simulator Version 2)

NS2 is a discrete event driven simulator, it is an open source simulator mostly used for academic research in the areas of Computer Networks, MANETs, WSNs. Since the days of its first release it has energized the minds of students, researchers, network practitioners opened up many possibilities for doing simulation of different protocols before they are actually implemented in real time^[2].

Presently NS2 development by VINT group is supported through Defense Advanced Research Projects Agency (DARPA) with SAMAN and through NSF with CONSER, mutually in teamwork with other researchers including ACIRI (see Resources)^[3]. NS2 is available on several platforms such as Linux, FreeBSD, SunOS and Solaris. NS2 also builds and runs under Windows.

Advantages:

- Low cost not require costly equipment
- Complex scenarios can be simply tested.
- Easy and quick way to rectify the errors.
- Supported protocols
- Supported platforms
- Modularity & Popular

Disadvantages:

- Real system too difficult to model.
- Bugs are unreliable

V. NS3 (Network Simulator Version 3)

NS-3 is a discrete-event network simulator, targeted mainly for research and learning use. Ns-3 is open software, licensed under the GNU GPLv2 license, and is publicly accessible for research, enlargement, and use^[7]. NS-3 is a C++ library which provides a set of network simulation models implemented as C++ objects and wrapped through python. The users usually interact with this library by writing a C++ or a python application which instantiates a set of simulation models to set up the simulation scenario of importance, enters the simulation main loop, and exits when the simulation is done^[8].

Advantages:

- The system has been modularized
- To allow for modular libraries
- Individual modules contains with directory structure
- To allow the node to use external routing

Disadvantages:

- Ns3 suffers from lack of credibility
- Modules, component based on ns2
- Ns3 needs lot of maintainers
- Active maintainers are required

VI. OMNET++ (Optical Micro – Networks Plus)

OMNeT++ is an expendable, modular, component-based C++ simulation library and framework, mostly for building network simulators. Components (modules) are programmed in C++, then assembled into larger components and models using a high-level language^[11]. OMNeT++ provides a component structural design for model. Such Components (modules) are programmed in C++, then assembled into larger components and models using a high-level language.

Advantages of OMNET++:

- Strong structured.
- Extremely modular.
- Not limited to network protocol simulation.
- Source code is openly available.
- Simulation model for internet, IPV6, mobility is also accessible.

Disadvantages:

- It does not offer a great variety of protocols.
- Users with significant background work.
- Poor analysis and management of typical performance.
- The mobility extension is comparatively incomplete.



VII. Netsim (Network Simulator)

NetSim is a network simulation and network emulation tool. It focused on network design, development process and security applications. Some technologies such as Cognitive Radio, Wireless LAN, Wireless Sensor Networks, Wi Max, TCP, IP, etc. are under in NetSim^[6]. NetSim is a collective tool for calculations of pipe networks for district heating, district cooling and steam.

Advantages:

- The Simulates forty seven numerous Cisco devices
- The Simulates network traffic through the usage of digital Packet generation to path packets and transfer frames
- permits to create your own simulated network with up to 2 hundred gadgets within the network topology
- To allow the instructors to increase the very own labs, whole with grading
- helps SDM simulation in decide on NetSim labs

Disadvantages:

- NetSim main drawback is single process discrete event simulator .
- A single event queue is represent the simulation which at any given time contains one entry for each station on the network.
- No Free version of NetSim is available.

VIII. REAL

REAL is a network simulator originally proposed for studying the dynamic behavior of flow and congestion control schemes in packet-switched data networks. It arranges the users with a way of specifying such networks and to simulate their behavior. It provides under the 30 modules (written in C) that accurately emulate the actions of several well-known flow control protocols (such as TCP), and 5 research development disciplines (such as Fair Queuing and Hierarchical Round Robin). To allows the latest modules to be added to the system with slight effort. Source code is give so that interested users can be modifying the simulator to their own purposes^[12].

The GUI as well allows scenarios to be simulated on a server kindly loaned to Cornell University by Digital Inc. The REAL simulator is written in C, and as well as run on Digital Unix, Solaris, IRIX, BSD4.3, Ultrix, SunOS, UMIPS systems on VAX, SUN, SPARC, MIPS, Alpha, SGI or DEC station hardware.

IX. J-Sim (JAVA SIM)

J-Sim (formerly known as JavaSim) is a component-based and compositional simulation environment. It has been frame by the notion of the autonomous component programming model

Like to COM/COM+, JavaBeans, or CORBA, the essential entity in J-Sim is components, but not like the other component-based software packages/standards, components in J-Sim are self-directed and are realization of software^[13].

J-Sim has been developed entirely in Java. This coupled with the self-directed component architecture, makes J-Sim a actually platform-neutral, reusable, extensible and environment. J-Sim also represent with a script interface to allow integration with various script languages such as Perl, Tcl, or Python.

Advantages of J-sim:

- J-sim is a Java - Based simulation and animation environment.
- Supporting with Web - Based simulation.
- J-sim provides a freely - joined component can be individually designed, implemented and tested separately.
- J-sim has been implemented on wired and wireless network component and protocols.
- J-sim is platform independent, extensible and reusable surroundings.
- WSN framework in J-sim performance good scalability.

Disadvantages:

- Java has a few defense regulations. So JSIM can be disallowed from persistence in statistics.
- Operation of JSIM required perfect idea of queuing algorithm.
- The graphical model fashion designer, which has restrained capabilities as of now (can simplest be used to design a version),
- The GUI-primarily based version builder which have lots of the code generation that has to be presently finished with the aid of manually.

X. GloMosim

GloMosim represent for global mobile information system simulator and satellite network simulation surroundings for huge and wire line communication network, mobile Ad-hoc network invented by ucLA similar computing laboratory^[5]. A utilize GLOMOSIM as parallel discrete event simulation implemented by parallel simulation environment for complex systems a c based simulation language developed for final year projects.

Advantages:

- It gives modular simulation for protocol stack.
- It is able of scaling up to networks with thousands of heterogeneous nodes.



- Parallel model execution is given to users in transparent manner.
- It is no cost for education and research.

Disadvantages:

- The documentation of GloMoSim is quite poor.
- No particular routing protocols for sensor network, no energy consumption models for transport layer and IP address support.
- It represents the Random Waypoint mobility model, which may not be suitable for all types of simulations.
- The developer team is targeting mostly on QualNet which is the commercial Version of GloMoSim

XI. CONCLUSION

This context is representing with a basic things of network simulation tools. In this research article have focus and discussed with various computer network simulation tools and also carry out the some advantages and disadvantages. It seems that the easier for the users to learn to use.

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