

# Simulations on Computer Network: An Improved Study in the Simulator Methodologies and Their Applications

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## ABSTRACT

Generally a network simulator is used to analyse the performance and behaviour of a network. The Simulation software plays a vital role in real-world implementation. The hardware setup of network topologies are very costly and strenuous to modify often. The simulators act as the protocols for a system. The simulators in network such as Ns-2, Ns-3, OMNeT++, NetSim, J-SIM, REAL, OPNET, OMNEST, QualNetTraNS, NTCUns etc. It is quite a tedious process to select network simulator that is based up on the requirement for a users specified job. This paper gives a comparison and a general analysis of various network simulators.

**KEYWORDS:** Network, Simulator, NS2, NS3, OPNET, OMNeT++, QualNet, NetSim and J-Sim

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## 1. INTRODUCTION

Network simulation is that the widely used and it's a standard method which is employed to guage different network topologies without world implementation. The Network simulators are used for Quality Assurance (QA) to design, simulate, verify, and examine the performance of networks protocols. A network simulator will incorporate of a wide variety of networking technologies; protocols and it help customers to build complicated networks from basic constructing blocks like clusters of nodes and links.

Network Simulation is a tool in networking for the program that controls the performance of a network system. It has the ability to consume lower costs when it is compared with the real-time. Every network simulator posses different types of features to enhance network performance. There are ample varieties of simulators that are available in market ranging from simple to complex levels.

### 1.1. USES OF SIMULATORS IN GENERAL:

Network Simulation is the most sought after research field, and it has now become an integral part of many research projects like commercial applications and academic research.

It helps to increase the efficiency of simulation.

- It provides details of the protocols and their operation.
- Reduce packet and event processing time.
- Specify the protocols and their applications.
- It allows fast development.

- Tcl is compatible with all platforms and flexible for integration.
- Tcl is very easy to use and it is available in free.

## 2. CLASSIFICATION OF NETWORK SIMULATORS:

There are many both free/open-source and proprietary simulators.

1. NS2 (Network Simulator)
2. NS3 (Network Simulator)
3. OPNET.
4. OMNeT++.
5. NetSim.
6. QualNet.
7. J-Sim.

## 3. TYPES OF NETWORK SIMULATORS:

### 3.1. NS2 (Network Simulator):

NS2 stands for Network Version 2. It is a one type of network simulator. It creates a network topology and observes the network behaviour. It is one of the open source simulator tool.

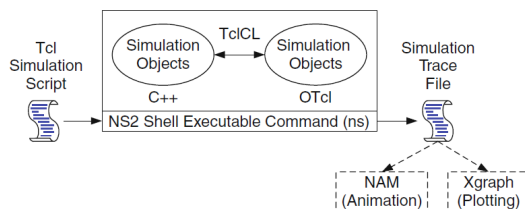


Fig 1: NS2 Basic Architecture

**Features:**

1. It is object oriented.
2. It is has protocol support
3. It is Unix Based.
4. It uses TCL for the scripting purpose.

**Advantages:**

1. Complex scenarios can be easily tested.
2. Results can be quickly obtained
3. Supports various protocols and platforms

**Disadvantages:**

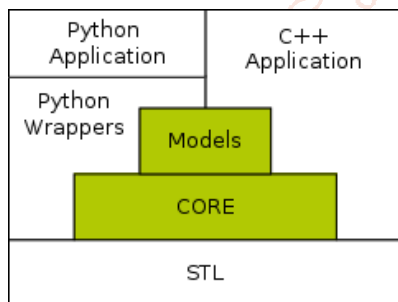
1. It has complicated structure.
2. Errors are unreliable.

**Steps to work in NS2:**

1. Download software NS2.
2. Install in your home directory.
3. Compile the latest version of NS2.
4. Create your own topology.
5. Verify the topology and directory
6. Modify codes
7. Create your own .tcl script.
8. Execute and analyze the result

**3.2. NS3 (Network Simulator):**

It helps us to create a virtual node. It is also one type of network simulator. It allows us to write the scripts by using C++ and python language. It is a Discrete Event Simulator. This Simulator has events which are associated with the execution and simulation time.



**Fig 2: NS3 Basic Architecture**

**Features:**

1. It has lower level of abstraction.
2. It acts as a simulator as well as emulator.
3. It supports authentication, virtualization, Tracing and Contradiction.

**Advantages:**

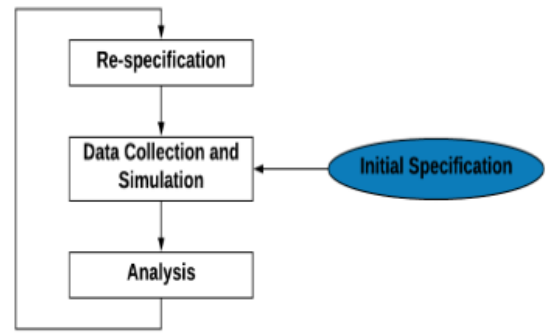
1. It has higher end of modularity
2. It is flexible to use when compared with NS2
3. It is more reliable with real time environment.
4. It has emulation mode to use.

**Disadvantages:**

1. It has limited boundaries with scalability problems
2. It has reliability issues.
3. It has limited support for Scripting.
4. Its maintenance level is more to check.

**3.3. OPNET:**

OPNET stand for optimized network engineering tool. It is a Modeller. It provides environment for network performance, modelling and evaluation of computer network.



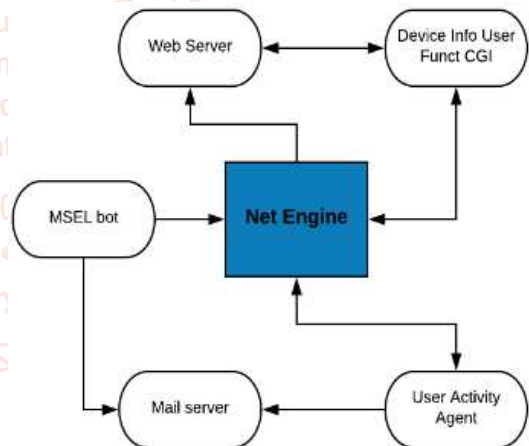
**Fig 3: OPNET Architecture**

**3.4. OMNeT++:**

Its expansion is Objective Modular Network Testbed in C++. It is used for teaching and other academic purposes. It is based on C++ Simulation of framework library functions. It is used for both the wired and wireless. It engages with parallel simulation and gives extensibility. This Simulator is also used for queuing, Modelling, evaluating the networks easily through the help of C++ as their scripting language. This Simulator is open source and free cost to use. It is available both in UNIX as well as in Windows based systems. It supports GUI.

**3.5. NetSim:**

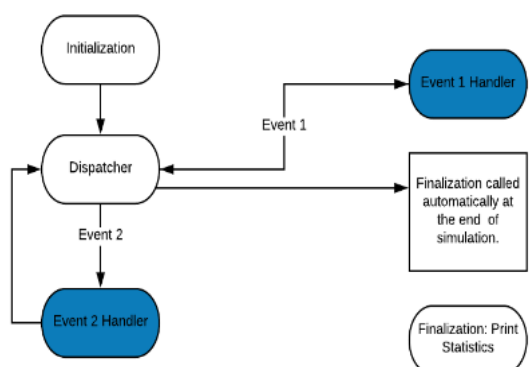
The NetSim was developed by byTecos in 1997. It has the Support of GUI. The NetSim has the debugging facility to check the network simulation with reliable connection. This simulator has Graphical options for comparisons.



**Fig 4: OPNET Architecture**

**3.6. QualNet:**

It is one of the Simulator tool. It is fully designed for defence purpose. It provides wired, wireless and also a mixed platform type of services of network to the users. This simulator has a heterogeneous network. QualNet is a version of GloMoSim.



**Fig 5: QualNet Architecture**

**3.7. J-Sim:**

This simulator uses of script languages such as Perl, Tcl and Python .It enables the user to design, verify the components individually. This J-Sim is written in Java language and it is also a platform independent simulator.

**4. COMPARISION OF SIMLUATORS**

The Table 4.1 shows the comparison between each of the simulators that works in wireless technologies.

S. No	Simulator Name	Availability Of License	Type of Language Used
1.	NS2 (Network Simulator)	Open Source	TCL,C++
2.	NS3 (Network Simulator)	Open Source	Python, C++
3.	OPNET.	Commercial	C
4.	OMNeT++.	Open Source	C++
5.	NetSim.	Open Source	Java
6.	QualNet.	Open Source	C++
7.	J-Sim.	Open Source	TCL,C++

**CONCLUSION:**

The above given entire context is saying about an overview of network simulators which are available as open source to the end users. We have discussed advantages, disadvantages

and features of Open-Source Technology. Its uses are more efficient for academics, industries, new of simulators in the field of network. The open source network simulators NS2, NS3, OMNeT++ and J-Sim. As a conclusion it would give clear idea about simulators to the learners.

**RECOMMENDATIONS AND FUTURE WORK:**

It is stated with three recommendations basically:

1. Choose/Opt for Good working network simulators
2. Focus up on analyzing the results and the performance with statistical reports.
3. Choose to Build a good and valid simulators to enhance their validation process.

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