A LITERATURE SURVEY OF NETWORK SIMULATION TOOLS

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*Abstract :*In the network research era, it is very difficult to deploy a network very efficiently as it takes too much time as well as money. Network simulation tool is the best source to develop a network as it helps a developer to check the functionality of a network in real environment. Thus simulator reduces the time as well as cost of testing of a network. In this paper, we provide the different simulation tools, their advantages and disadvantages. This survey is a approach to give advantage for those who feel difficulties to select the appropriate network simulator.

Keywords: Network simulator, NS2 ,NS3, OMNET++ ,OPNET, QualNet.
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I. INTRODUCTION

Simulation is a very essential technique. In this modern technological era simulation is very helpful to verify the functionality of a particular object. It is a technique in which hypothetical or real world objects can be presented into a graphical format and we can monitor them on computer. This technique can be used in different fields for different purposes. [1]

Network can also be simulated or we can say we can analyze. the overall performance of our network on a computer. Network simulation focuses on the actual functionality of a network rather its physical features. In general it is useful to test different protocols and their effects on network. The simulation helps to test the network on different parameters which is sometimes very time consuming and costly in real world environment. [2]Thus it reduces time as well as cost. As technology is developing day by day so many companies have new tools on the internet. Thus network simulation always requires an open platform which is efficient enough to adopt new things which are required to simulate a network properly.[3]

Generally ,simulators make a model or prototype of a real world object and then analyze it. Modifying a existing model according to new requirements is quite easy rather developing a new one. Simulators provide that particular modification at a lower cost.

We cannot say that simulators are perfect. [4]But if they are used properly to analyze overall performance ,they give better results to a researcher. We have so many types of network simulators like commercial and open source simulators or static and dynamic simulators .[5]

1.1 Commercial and open source simulators

Some simulators are special and these are not free for all users. It means users have to pay some amount to access their software and packages. These simulators are complete and provides generally up to date features because they are documented by specialized staff of a company so these simulators are efficient enough to work upon a new technology. This is the main advantage of commercial simulators. [6]

Despite open source simulators are not advantageous in this scenario. But open source simulators are open from everywhere or for everyone i.e. everything is open , interface is also open so everyone can organize it. Thus it is very flexible and fast to adopt new things. Some simulators are:[7]

Table 1

Commercial simulators	OPNET, QualNet
Open source simulators	NS2, NS3, NetSim, OMNET++

1.2 Static and dynamic simulators

There are so many types of simulators are available ranging from very simple to a complex one. [8]Simulators basically provides the complete analysis of network topology by giving the information about its nodes and links between those nodes etc. some simulators provide information on the basis of graphics and some are programming based which help to develop a particular application to analyze a network.[9]

II. Introduction of Some network simulators:

2.1 NS2(network simulator 2)

NS2 is a purely object oriented simulator. It is a discrete event simulator targeted on network. It is a second version of NS.
First version was developed in 1989. NS2 is basically based on Real Simulator.
NS2 supports for TCP routing and multicast network analysis, it may be wired or wireless network. It can be used in distributed networks NS2 provides emulation technique.[10]

Language

C++ , OTCL (TCL scripting language)
Both the languages have their own features. Due to their internal characteristics both the languages are used in NS2 to work efficiently on network. C++ language is fast to run and slower to change. C++ is efficient to develop a design of network but it can not simulate the network graphically. It is not so easy to modify a design of network with C++ because it is used only for the implementation of detailed prototype of network. OTCL contains all those features which are not present in C++. Thus the combination of both the languages are used to simulate a network effectively. OTCL is used to control the simulating environment. It means it control over the protocol went to start or went to stop. Event driven scheduler keeps track on simulation time. When a user wants to make a network object it has both the choices either it may create a new object or it may modify the existing object component. It is a very powerful feature of NS2.[11]

2.1.1 Working steps in NS2

- Download the software NS2.
- Install NS2 in your home directory.
- Compile the latest version of NS2.
- Validate NS2.
- Create your topology.
- Need to understand the real topology and the directory structure in NS2.
- Modify the existing codes (C++ and / or .tcl files).
- Create your own .tcl script for this.
- Execute the script.
- Analyze your result.

2.2 NS3(Network Simulator3)

NS3 is similar to NS2. NS3 is a new version it is not updated version of NS2. Just like NS2 , NS3 is also event driven simulator. The prototype generated by NS3 is similar or very close to real world object. It uses C++ with python scripting language.it completely depends on modifying an existing system.[12]

Languages:

  NS3 comprises of C++ with python. NS3 is developed as a C++ library and then this library is linked with the C++ main program for interfacing. Python is used to wrap C++. However NS3 is still in process.

2.3 OPNET(Optimized network engineering tools)

OPNET is a very popular commercial simulation software. It is used to analyze a complete heterogeneous network with different network topologies. OPNET is developed by OPNET technologies. In the year 1987 it became a very famous commercial simulation software .it was most popular software by the end of 2008.
OPNET provides a environment which is scalable enough for development of communication network and distributed systems by performing discrete event simulation, performance and behavior of the network is calculated.
It works in the three main modules :modeling, simulation, analysis of network. For modeling of a network OPNET uses GUI(Graphical User Interface). As it provides a network with its all the components in graphical format.[13]

Languages

main language used for OPNET is C, but recent versions of software supports C++. Initial setup for modeling requires GUI , some XML files, or sometimes C library calls.

2.4 OMNET++

Similar to NS2 and NS3, OMNET++ is also an open source simulator. It represents a framework approach. OMNET++ is a component based simulator in which small components are combined to build large components or modules. It is also a discrete event driven simulator same as NS2 and NS3. [14]

As OMNET++ is a component based simulators . Components are modules and programs in C++. It works with the support of GUI. It is not a simulator actually, but it is used in academia and network systems. OMNET++ is used for many communication network systems, parallel and distributed systems and multiprocessor systems. [15]

Language

basically components are C++ programs. Higher level language used for OMNET++ is very similar to OTCL used in NS2 and python used in NS3. Modules are developed completely separated from OMNET++ and generate their own cycle. It is an important feature of OMNET++.

2.5 QualNet

QualNet is a discrete event driven simulator. It is a updated version of GIoMoSim. QualNet is used in parallel and distributed network which carries heavy traffic thus QualNet is used to control that traffic in that particular network. [16] It is a commercial network simulator. It consists components like packet tracer, scenario designer, animator for visualization of data and analyzer to control the traffic. QualNet does not have predefined modeling constructs. Generally QualNet is used for large heterogeneous networks which may consists different type of nodes.

2.5.1 Working steps

- Prepare configuration files for your protocol.
- Run QualNet on the config files.
- Examine the output statistics file use script language (perl / awk) to process it.
- Use plotting tools (gnu plot) to create graphs from above results.

III. SUMMERY

In this paper we have discussed about different types of network simulators ,their functional approach and behavior. Initially we gave an introduction about what is a simulator and how it works. Later we briefly discussed about some types of network simulator with their application area. It seems easier to study and choose the correct simulator for the analysis of network.

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