Comparison Of Efficiency Of Network Simulators

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Abstract:

This paper presents comparative study between two network simulators (NS-3, OPNET), based on the software used and architectural simulator and Required Resources. To compare the performance of these two simulator under similar conditions and at the same time, then measuring the (time and memory) for each simulator and recorded and analysis.

Keywords: Network Simulator , NS2, OPNET.

الخلاصة :

هذه الورقة تقوم بدراسة نوعان من اهم محاكيات الشبكات (NS-3, OPNET) بالاعتماد على البرمجة المستخدمة في كل محاكي والمصادر المطلوبة لمقارنة اداء كل منهما تحت نفس الظروف من حيث حجم الشبكة وقياس المصادرة المطلوبة (ذاكرة ،وقت) وتحليلها .

الكلمات المفتاحية : محاكي الشبكات ، NS-3 ,OPNET.

1.Introduction :

With increasing interest and continuous development of computer networks, technologies and protocols used in experiments to determine the topology and protocols best suited and test those networks in a virtual method before they are applied in the real world .Network simulation is used in different areas it became one of the important networking fields of study and become necessary to find a program that simulates networks and can test algorithms to obtain the results without the implementation in the real world, while is expensive this has led to the emergence of network simulation programs, where NS-3 OPNET NETSIM is the most important programs that has been used on commercial scale and research.(Mishra and Jangale,2014)

(Chaudhary *et.al.*, 2012) Compared NS-2 and NS-3 They found NS-3 does not have all of the models that NS-2 currently has on the other hand, NS-3 does have new capabilities(Chaudhary,2012).

In this paper we study and compare the two types of simulator (NS-3, OPNET) in terms of the efficiency of each and sources required for different network sizes, architectural simulator, protocols supported, and compare the results and analysis under similar conditions.

2.Comparison Between Ns-3 and Opnet Technically

NS-3 is object-oriented program targeted primarily for research and educational use in 2006 It was written using the C ++ language and Pytho those two languages have strength and weakness point, NS merging these two languages worked on integration. Ns-3 uses to simulate the wired and wireless networks It is also used to simulate the local area networks and wide area networks(Saxena and Husain,2015)

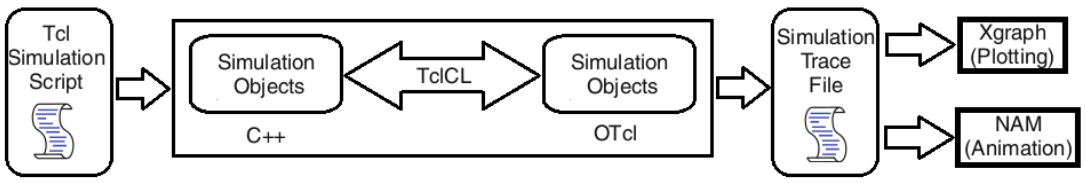

Fig1:Ns-3 architecture

OPNET is a tool for simulations of networks. It is able to work with OSI model because it can handle the seven-layer of OSI to modify the physical parameters. OPNET Modeler comprises several tools, each one focusing on specific task (Sethe and Hnatyshin,2012)

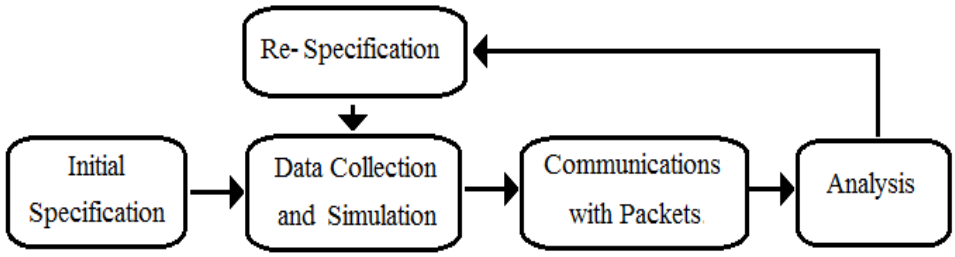

Fig2:OPNET architecture

2.1. The Supported Network Technologies

Both OPNET and NS-3 support many of the protocols, routing algorithms, and various application technologies used in wireless and wire networks. (Table 1) shows the protocols that are supported by each emulator for the various levels(Siraj at.el., 2015**)**

	Network protocols supported by the ns-3	Network protocols supported by the opnet
Application level Protocols	HTTP,TELNET,SMTP,FTP, DNS	HTTP,Telnet,DNS,POP3,SMTP,FTP
Transport level Protocols	TCP,UDP	TCP, UDP, RTP, SRM, NCP
Scheduling disciplines	drop-tail, RED, FQ, SFQ, DRR, RR	Drop Tail, FIFO, RED, CBQ, WFQ, SFQ, DRR,FQ, RIP, OSPF, BGP, IGRP, EIGRP, IS-IS
Wireless Networking	Ad-hoc routing and mobile IP:AODV Sensor-MAC, WiMAX Power control in wireless networks	Ad-Hoc Routing protocols, Multi-hop routing protocols(DSR, AODV, TORA,DSDV)

Table 1: Network Protocols(Patel and Kamboj,2015**)**

3.Simulation Setup And Results

a simple simulation has been designed using NS-3 and OPNET Network simulators. the NS-3 and OPNET installed on Ubuntu 16.04 machine with core i7 (1.73 GHz) of processor ,RAM 4G. As shown in (Fig 3) The nodes are arranged into square shaped topology, the network consists of A*A (A∈ [3, 20]), The node number one as sender And sends the packet to its neighboring node, which is then forwarded by each node To the respective neighboring nodes, and finally arrive into receiver. In order to make the network as simple as possible in both Simulators .The simulations used in the modeling scripts are as consistent as possible. The packet is sent from End through a number of intermediate nodes to the receiving end, in addition to artificial in the link On the set data transmission packet loss rate, the collision and congestion are not Considered, this design of the network and the reality of the network is very different, this also Is the reason why it is called an abstract network.

After completion of the first network 3 * 3 node we gradually expand the network to 20 * 20, then register the consumption of both memory and CPU in terms of time and data for each stage

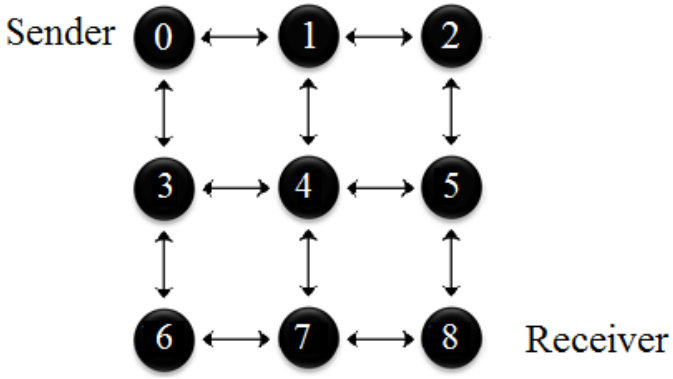

Fig3: Network Topology (size=9)

of the expansion of the network, and in the end presented in the analytical charts to compare all of the a performance simulator:

1. In Figure 4, compared to consumption of both the simulator in terms of memory depending on the size of the given network.

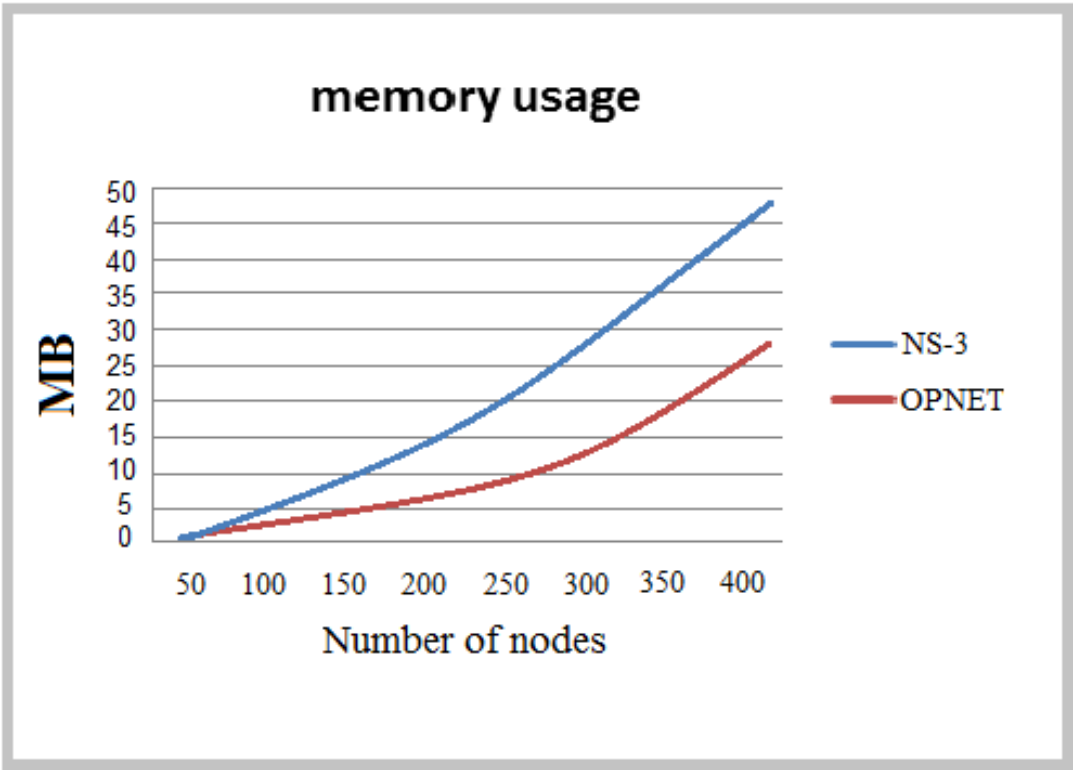

Fig4: Memory usage vs. Network size

2. In Figure 5, compared to consumption of both the simulator in terms of time depending on the size of the given network.

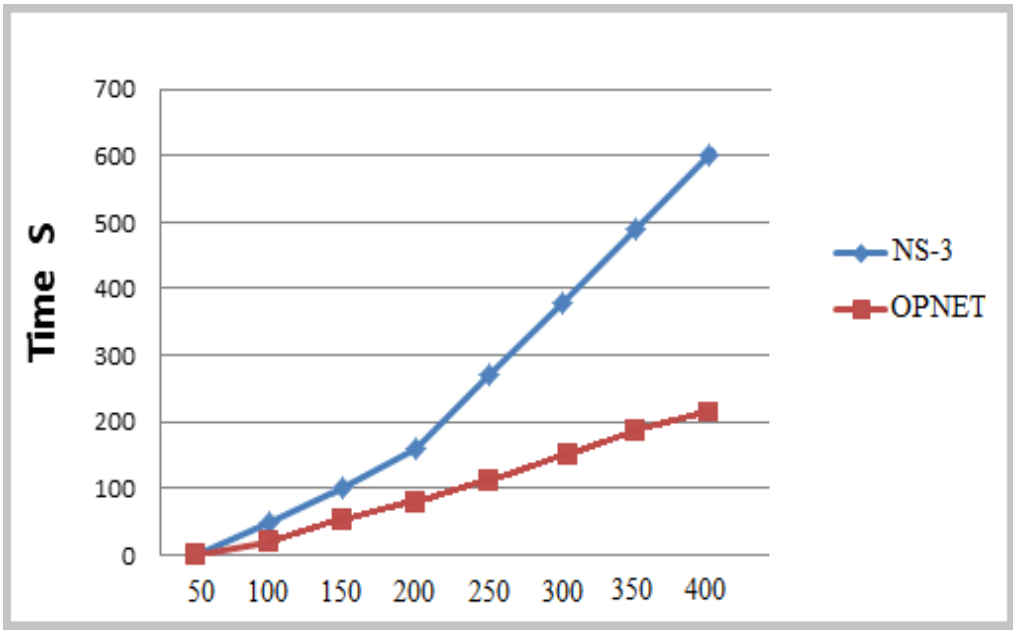

Fig5: Time vs. Network size

Conclusion

When the network is small size, both the simulator requires the same sources of memory and a processor almost ,but when increase the size of the network and the number of nodes is increase, the OPNET more effective than NS2 one hand sources .NS2 you can work on the GUI Platform because it is open source, and the other hand NS2 have script larger for the same reason. NS2 network model established need to use a scripting language Python. In general, the simulator OPNET is used wider for business while NS2 is used for research purposes academy.

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