The Effectiveness of Network Algorithms Using NS-2

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Abstract:

We have considered in this study the purpose of the network simulator and the basic functions of it .In addition; we have given the structure and the function of the basic routing algorithms of NS2. It have done a simulation algorithm for the Distance Vector Routing, statistical, session. It has been achieved depending on the simulator, time comparison and the number of the nodes via the use of multicasting.

Keyword: NS2, simulator, multicasting, nodes

الخلاصة

لقد اخذنا بالاعتبار في هذه الدراسة الغرض والوظائف الاساسية لمحاكي الشبكات **(NS-2)** وقمنا بإعطاء تركيبته ووصف خوارزميات التوجيه الاساسية عليه وانجاز محاكاة لخوارزميات **(DV)** ،الشبكة الاستاتيكية ،الجلسة. وقد تمت الدراسة بالاعتماد على المحاكي ومقارنة الوقت وعدد العقد باستخدام نطاق الارسال المتعدد .

الكلمات المفتاحية : NS-2 ، محاكاة ، الارسال المتعدد ، العقد

1.Introduction

NS2 is an open source a network simulator designed specifically for research in computer communication networks.which turns out to be the most adapted among similar products designed to conduct scientific researches in the field of computer networks. A lot of users implement the simulator for educational purposes in this case the simplicity of the software is really important and the ***goal*** of the given work is to study routing algorithms using the NS-2 simulation system (Altman &Jiménez, 2012). The following tasks must be performed specification of the NS-2 purpose, emphasizing the main functions of the network simulator, presentation of the NS-2 structure, presentation of a model using routing algorithms and experiments with models(Harju&Korventausta, 2001). The Importance of the tasks is proved by the increase in the number of requirements to the effectiveness of design and usage of computer networks, its correspondence to current and future requirements, possibility and cost of future development and transfer to new technologies, especially under inefficient financing of information technologies at enterprises .

2-Why NS-2

Ns-2 is a discrete event simulator targeted at networking research. Ns-2 provides substantial support for simulation of TCP, routing, and multicast protocols over wired and wireless (local and satellite) networks (Issariyakul & Hossain , 2012).

The ns-2 allows performing simulation of communication networks and it possesses a number of characteristics, which include performance, good scalability, visualization of results and flexibility (Altman & Jiménez, 2012). it is able to simulate fixed and wireless networks regardless of their topology and it supports a wide range of protocols: protocols of application, network, transport, link and physical layers (Pandey & Tyagi,2013). For mobile networks; NS-2 is able to simulate behaviour of users network nodes movement in time ; signal attenuation according to different models of electromagnetic wave propagation; power consumption of network nodes (Ezreik & Gheryani , 2012) and it works in Linux operation system.

3. NS-2 Directory Structure

The full version of Directory Structure is showing in Figure.1 (Meeneghan & Declan,2004)

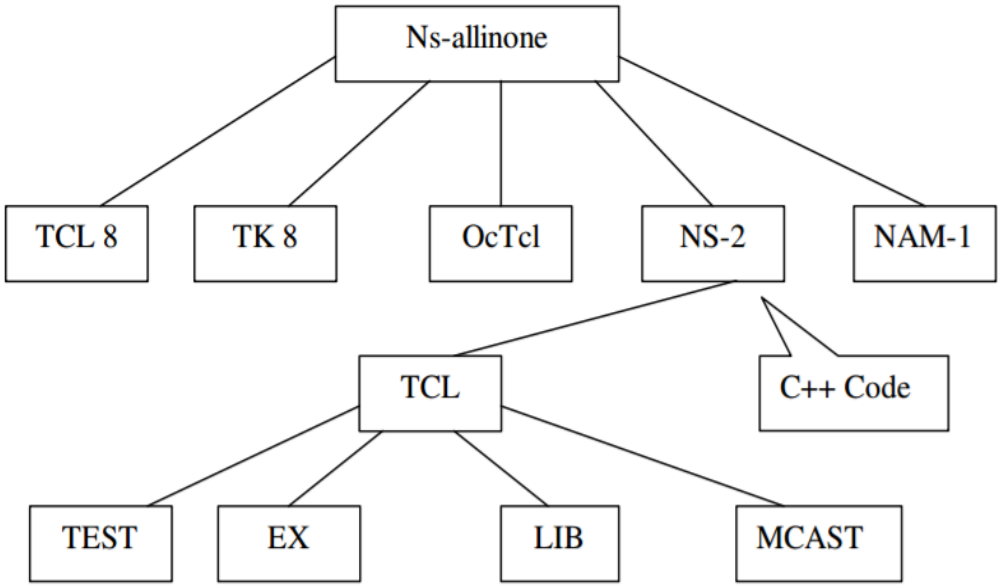

Fig.1 NS-2 Directory Structure

4. Basic functions of NS-2

The basic functions of NS-2 simulation system correspond to objects of the systems. The objects of the NODE type are dedicated to work with a node: obtaining a list of neighbour nodes, attachment and detachment of agents to a given port.

The objects of the LINK type are dedicated to determine the amount of time needed for packets to pass the connection and tracing dynamics for the given connection and recording of the information into a file. Connection is characterized by the following parameters: bandwidth, delay and probability of packet loss.

The objects of the QUEUE type are the main class of objects for packet management under their movement along the given topology (Meeneghan & Declan, 2004).

The objects of the QUEUEMONITOR type are used for monitoring of packets and bytes, which are being received, sent and dropped (Meeneghan& Declan,2004). They also support calculation of statistics (an average size of a queue, integral value of a queue size in bytes and packets)(Kumar, Rai & Mall,2016)

protocol according to laws of exponential distribution, the Pareto's law, as well as with the possibility of traffic loading from a trace file). NS-2 allows creating a new agent.

The Network Animator supports graphical reflection of simulated network topology, animation of the packet layer and also different means for data inspection . The reflected data can be obtained as a result of an NS-2 type simulator performance or real network traffic study (Kumar , Rai & Mall , 2016).

The xgraph is representations for the simulation results. Itis important because it allows some basic animation to data sets. The data sets in the order in which they are loaded . It is quite crude, but useful if all the data sets are in one file in the time order , and are put out at uniform intervals. Also, the code will take derivatives of your data numerically and display these in a new XGraph window. (Issariyakul& Hossain,2011)

5.Models and algorithms that are under study in this research

Further we will consider the use of routing algorithms available in the NS-2 (DV ,Static, Session).

The topology consisted of seven nodes is presented in (Figure 2) . Each node, except for the last one, connects with the following node, and the last node connects with the first one . The data are transmitted from node 0 to node 6 (Figure. 2).

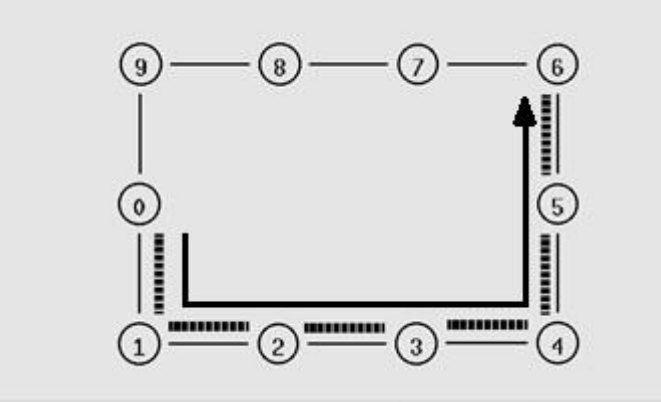

Fig.2 Ring network topology initial packet route

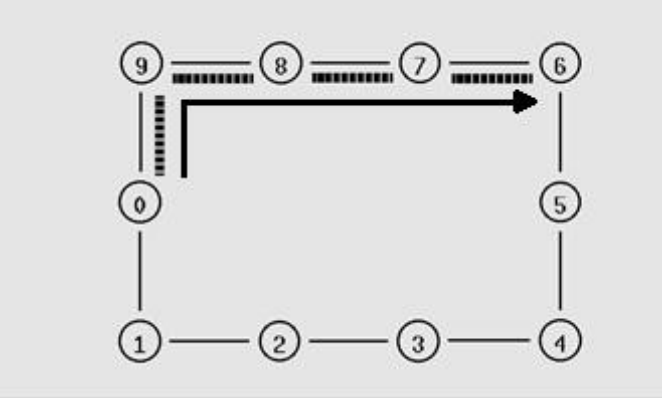

Fig.3 Ring network topology New packet route

The connection between 0 and 6 nodes during the time of 1.0 and 2.0 seconds will be broken, and the packets, which are transmitted in this time, will be lost because the Static algorithm (based on the Dijkstra's SPF algorithm; the route is calculated once before the beginning of simulation) is used by default(Yue-Zhen, Dun-Min Lu, Qing-Chun Wang, & Fa-Chao Jiang,2010).

To solve this problem we use the DV mechanism, which supposes calculation of routes using a simple routing protocol with calculation of a distance vector (decentralized routing: an agent is created at each node). Right after the simulator has initiated, several small packets are sent in the network;(Yue-Zhen, Dun-Min Lu, Qing-Chun Wang & Fa-Chao Jiang , 2010) these packets are used for exchange of information necessary for routing between nodes

After breaking the connection, a new route will be calculated and packets will be sent via nodes 9, 8 and 7 (Fig. 3).

However, in this example it is better to the Session routing mechanism (centralized routing: the route is calculated under each change of topology), because despite the above mentioned models, only those packets, which have been passing through the given connection at the moment of connection breaking, will be lost.

All the above mentioned routing algorithms support calculation of the route considering connection weights.

The next example gives the topology with ten nodes, one of which performs multicast data transmission to ten other nodes (Figure. 4).

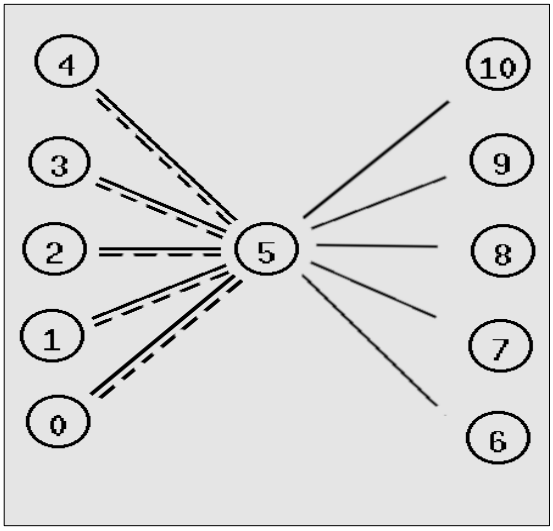

Fig.4 (A) Topology with multicast data transmission

Nodes 0, 1, 2, 3, 4 are added to the multicast group before the simulation process has been started As shown in (Figure.4 (A)).

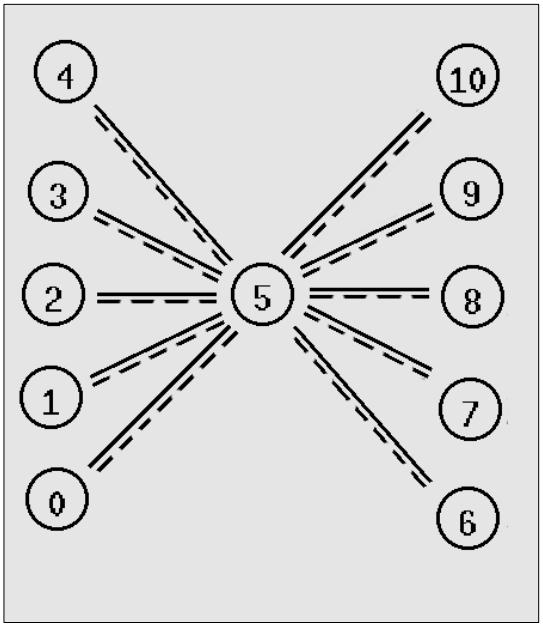

Fig.4 (B) Topology with multicast data transmission

nodes 6, 7, 8, 9, 10 are attached into the multicast group at the moment of 1.00 seconds and deleted from the group at the moment of 2.00 seconds As shown Figure.4 (b) . Node 5 starts data transmission at the moment of 0.25 seconds.

In order to study the time of network simulation with the given topology it is necessary to add new nodes into the network and include them into the group of nodes, which multicast data transmission is addressed to (multicast group). The dependence of network simulation time on the number of nodes is given in Fig. 5.

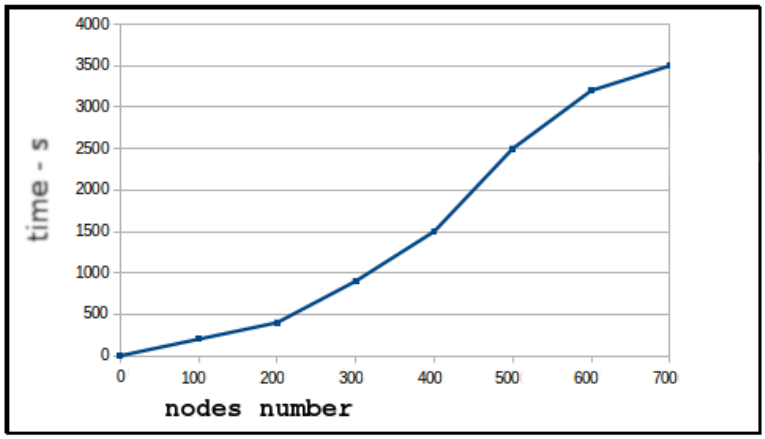

Figure 5. The graph of network simulation time dependence on the number of nodes

This study used a maximum of 700 node because limited of computer memory size which is produce error if any node added in the system and that we confine ourselves to this number of nodes.

This study has been tested on a personal computer and the specifications are
Ram : 4 GiB
processor : Core ™ i5-2410M CPU @ 2.30GHz × 4
OS type : ubuntu 16.04 lts (64 bit).

Conclusion

This study helps to increase the efficiency and reliability of methods of transfer data packets in real computer networks. Test networks in the lab and find out its effectiveness before they are implemented in reality and find errors. Given models can be used by researchers in computer networks.

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