

# Performance Parameter Analysis of Wireless Ad hoc Network Using NS2

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**Abstract** - The Wireless Ad hoc network is the network with dynamically moving nodes forming temporary network. As in the Ad hoc network every nodes are mobile and moving from one point to other point there may be change in the quality of the service, there may be possibility of packet drops, packet delay, jitter degrade and change in throughput. In this paper analysis of wireless ad hoc network is performed in UDP and TCP environment and various parameters like packet drop ratio(PDR), throughput, end to end delivery (ETED), delay, jitter etc. are measured using NS2. Wireless ad hoc network is one of the most research area due to the recent growth in the wireless technology to obtain every time better performance through the wireless network. This measurement is performed using network simulator version 2 (NS2). This paper focuses on the definition, implementation, and analysis of an ad hoc wireless network using network simulator. Results presented in this paper can be used as a performance reference for the development of wireless network.

**Index Terms**—NS2-Network Simulator Version 2, ETED-End To End Delivery, PDR- Packet Drop Ratio, jitter, throughput.

## I. INTRODUCTION

The performance parameters like Packet Loss, Packet Delivery Ratio, Jitter, End to End Delivery, Throughput etc. decides the Quality of Service of the network. In practical Real network practical measurement of these all the parameters is fundamental to understand the behavior of the network, various protocols of the network and to provide better performance by the network. Currently Wireless ad hoc network are growing at increasing rate. The network capacity has increased dynamically and the number of the “users” supported by the network. Smart devices, Portable devices, and wireless network becomes the integrated part of the new technology. The main demand from the user is to get better Quality of Service from the service provider. So here we have created one ad hoc network using simulator tool NS2 and transmitted data bytes from one node to the other and measured various parameters. The performance parameter can be measured by two ways. 1) By performing experiment on a real existing network 2) By using simulation technique. The measurement on real existing network require to have larger number of hardware, software and to connect measurement tools to the network. There may be also issue of permission for the connection with the existing network. So another method using software simulation and creating virtual network is more preferable. It is also possible to create network as per the demand in simulator and measurement doesn't require any hardware. So here we have measured every performance parameter using simulator named Network Simulator which is a Linux base simulator.

## II. PERFORMANCE PARAMETER ANALYSIS- A BRIEF OVERVIEW

Currently due to the recent Technological growth Wireless networks becoming highly popular as it offers mobility. As a result number of users of a wireless network also increases. So it is necessary to provide good service at affordable rates. **DELAY** is defined as how longer time it takes to deliver packet to the destination. The **DELAY** should be as low as possible. **PACKET LOSS** is the loss of some part of the data which requires retransmission by the transmitter. There should be no packet loss ideally. **JITTER** is the undesired deviation from the true periodicity of a periodic signal in communication. The **JITTER** should be less. **THROUGHPUT** is the amount of traffic that a network can carry. **End to End Delivery** is the time taken by the network for transmission of packets from the transmission to receiver. In addition to this **ENERGY** of a bit also plays an important role in wireless network. It is required to measure all the parameters that can be used as a reference for the development of the new network and it can be also helpful for the improvement in the network. Here we have used a simulator named network simulator version 2 for the measurement of parameters.

## III. PERFORMANCE PARAMETER MEASUREMENT METHODS

- Using practical set up on an existing network
- Using simulation techniques.

### *Using practical set up*

One can measure various parameters on an existing network using practical set up of hardware and software. The practical set up require to have wide set of hardware and powerful software. In addition to these it is necessary to attach every hardware to the network. This is really a time consuming process. In addition to these there may be issue of permission of the service provider. However these method provides actual live stream of data and measurement result is more reliable compared to simulation techniques. Another option which is less costly and requires only simulation software.

### Using simulation techniques

Simulation is a very important modern technology. Computer assisted simulation can model real life activities and models on software so that it can be studied to see how the system functions. Different variables can be used to predict the behavior of the system. For the network simulation the computer assisted simulation technologies are being applied in the simulation of networking algorithms or system by using software technology. Since the network technology is developing very fast and so many different organizations are taking part in the process they have different technologies running on different software. Various simulation techniques are available for the performance measurement. One main advantage of the simulation technique is that it does not require wide set of hardware and it is possible to obtain all the results using only software. It does not require to have an existing network and possible to build our own network as per the requirement. Various techniques that are currently available are **NS2, TOSSIM, Em Star, OMNeT++, J-Sim, ATEMU, Avrora etc.** Out of which we have used **NS2**. Some of the network simulator are commercial means they do not provide source code of the simulator. Users need to pay for the license of the simulator software. The commercial software has the advantages of having up to date package of documentations and are continuously maintained by the highly qualified professional staff. While the others are the open source simulators in which source code are open to all. However they are not maintained continuously and when update version comes with new features there may be problem with the compatibility with the previous version files. One typical example of the commercial simulator is OPNET MODELLER while NS2 is the open source simulator.

### IV. NETWORK SIMULATOR VERSION 2- A BRIEF OVERVIEW

Network Simulator version 2 which is widely known as the NS2 is the event driven simulation tool which is useful in studying in the dynamic nature of the commercial networks. Simulations of the wired as well as wireless networks with routing algorithms and protocols like TCP and UDP can be done using NS2. NS2 is the second version of the series. The first version was released in 1989 and the NS2 is released in 1996-97. Due to its flexibility it continuous gain popularity in the networking research. The Defense Advance Project Research Agency (DAPRA) supports development of NS2 using Virtual Inter Network Test bed (VINT). Now National Science Foundation also helps in development of NS2. NS2 provides users with an executable command `ns`, the name of the Tcl simulation script. In most cases simulation trace file is created and is used to create graph or animation. Mainly two languages are used in NS2. One is C++ and other is Object oriented Tool command Language (OTcl). Here C++ defines the internal mechanism of the simulation objects and OTcl sets up the simulation by assembling and configuring the objects. It also schedules discrete events. The C++ and OTcl are linked together using TclCL. Here every functionality is defined in the mapped C++ object. It defines its own procedures and variables to facilitate the interaction. Here the member procedures and variables in the OTcl domain are called instance procedures and instance variables.

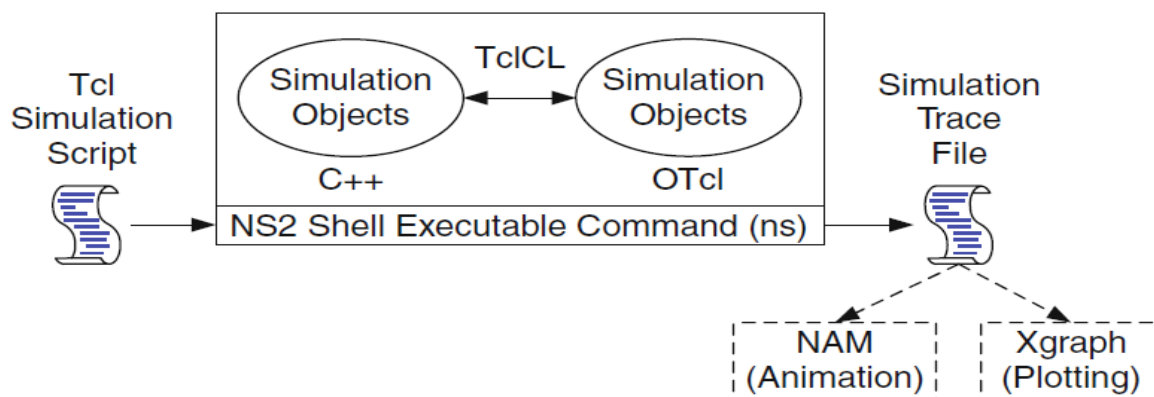


Fig.1 Basic Architecture of NS

NS2 provides large number of C++ objects. It is also possible to develop our own C++ objects as per the requirement and use OTcl configuration to put together these objects.

After simulation NS2 outputs either text based or animation based simulation results. To interpret these results graphically tool such as NAM (Network AniMator) and XGraph are used. To analyze a particular behavior of the network user can extract subset of text based data and can be transformed to more convenience presentation. NS2 is a free simulation tool which can be easily obtained online. It runs on variable platforms like Linux, Windows and Mac OS. However it is originally developed in the Linux environment so it works easily with the Linux platform and installation is also very easy with Linux environment. The current all in one suite consists of mainly NS release 2.3, Tcl/Tk release 8.4.13, OTcl release 1.12 and TclCL release 1.18 and the optional components like NAM release 1.12, Zlib version 1.2.3, and Xgraph version 12.1.

### V. EXPERIMENTAL RESULTS AND ANALYSIS

We have developed wireless Adhoc network Tcl script with 7 moving node and transmitted data. After running the Tcl file on simulator we got the output file with NAM file also. The output file is than attached with various script of delay, jitter, throughput awk file and the available data is then plotted using gnu plot software. The various analysis graphs are given below.

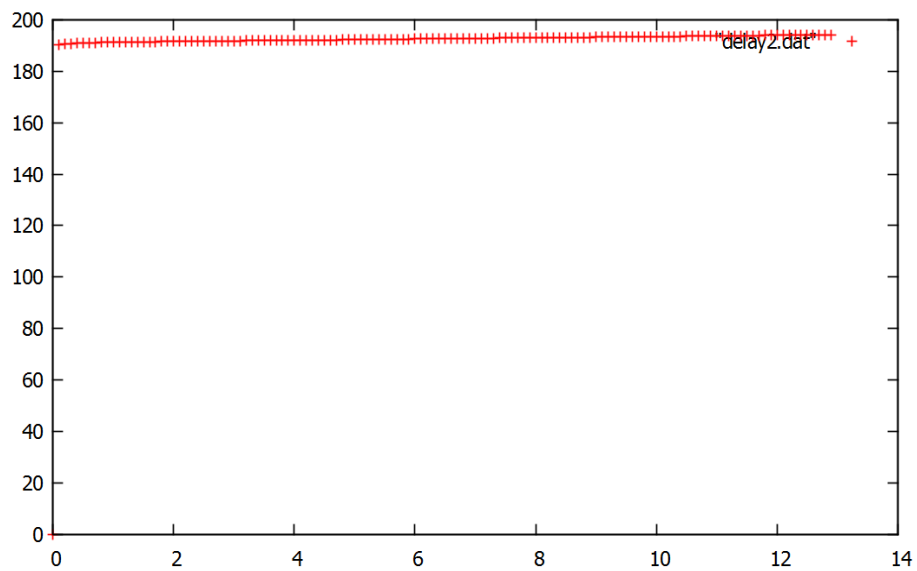


Fig. 2 Delay Measurement.

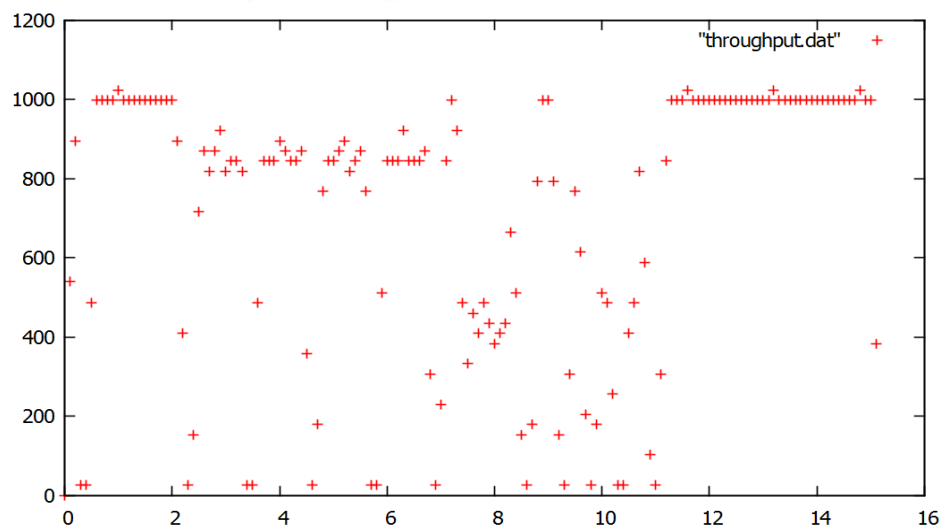


Fig.3 Throughput Measurement

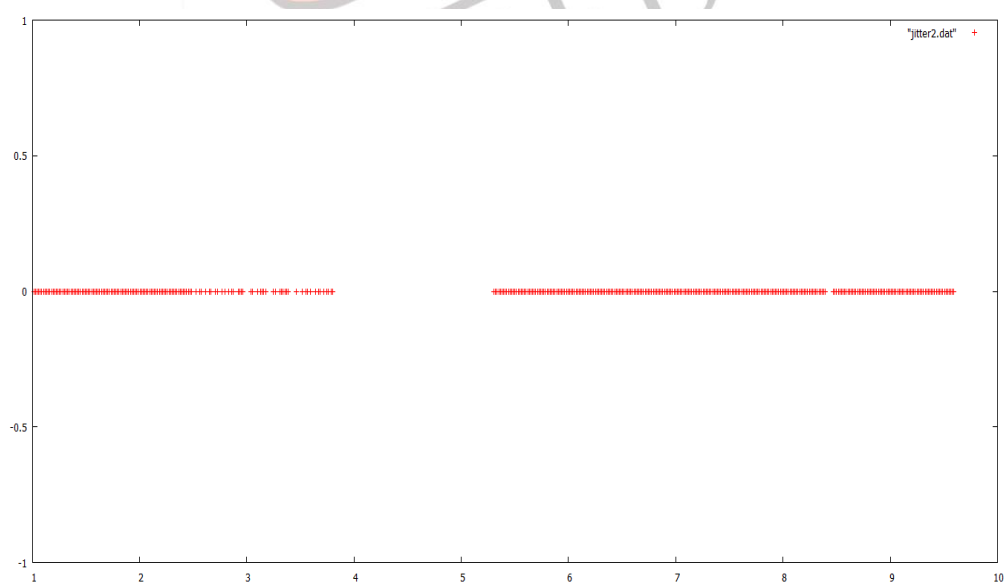


Fig.4 Jitter Measurement

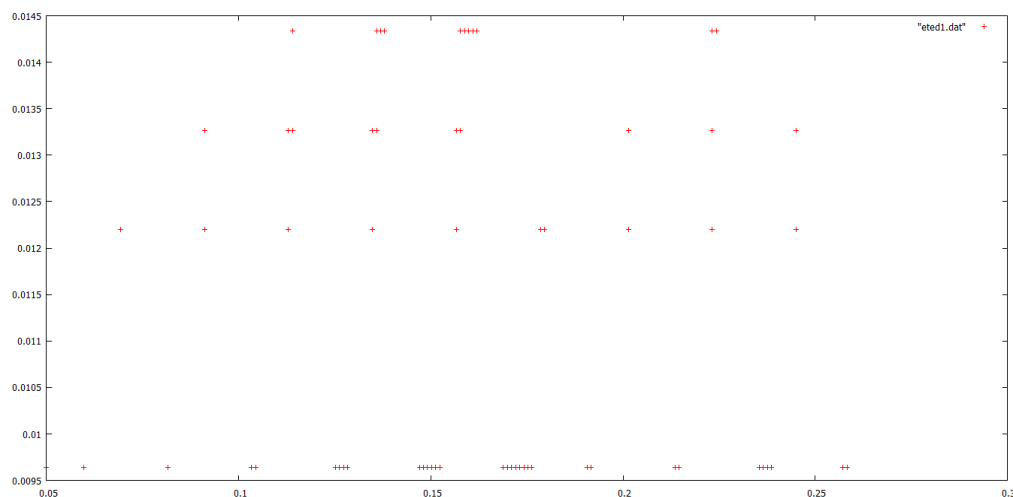


Fig.5 End to End Delievery

Packet Loss		Energy		Average Throughput
Sent	Loss	Average	Total	
7354	5	16.18	809	96

Table 1. Average Measurement

## VI. CONCLUSION

These measurements of the wireless Ad hoc network can be used as a reference for the development of the new wireless network and these data can also be used as a reference for any of the analysis.

## VII. ACKNOWLEDGMENT

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