Traffic Generation of Mobile Network using QualNet Simulator

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Abstract:- Nowadays the wireless network application becoming more complex, designing and testing almost impossible without proper software. On this behalf QualNet provides a heterogeneous wireless access facilities which are available on mobile terminals used by the operators to improve the quality of services to better manage the network resources. Basically QualNet has a huge number of versatility. It can support a wide range of networks i.e. Manet, QoS, Cellular, Satellite etc.CBR this term is mainly used in this paper because it is related to the quality of service of a device. It is used for streaming multimedia content on limited capacity channels. So here we generate some wireless subnet scenarios, basically subnet means logical partition of IP network into smaller network segments; which helps its connected devices to communicate between them. Next we are adding traffic generators, clouds to our scenarios for analysing the performance of our model.

Keywords:- QualNet, CBR, FTP, MOBILITY, CLOUD.

1. INTRODUCTION

With the increase in technology day by day we need complex software which has got much versatility which can implement many designs, models and simulate them. So here comes the need of software which is a tool for scientist, engineers & network planners for creating virtual models, the models have different types of network elements which comprises various types of nodes, satellites, mobile phones etc [1].

1.1 ABOUT QualNet:-

QualNet is such a software which has many comprehensive tools with all network modelling and simulation which can design any complex design in this era [2]. QualNet simulator is a commercial version of GloMosim stimulator [3]. It is widely used for creating and animating different scenarios and analysing the performance of different network and to design different networks with mobility and different traffic generators [4]. The QualNet platform has got mainly three libraries of component which includes a) Developer b) Wireless c) Multimedia enterprise etc [4]. It has a design mode for designing various virtual network models which includes subnets, Parameters of network nodes & Physical characteristics such as terrain. Mainly virtual models are used for simulate the behaviour of networks under a wide variety of traffic patterns at a faster speed greater than the real speed [4].

1.2 ADVANTAGES:-

QualNet has got many advantages &multi-threading capabilities of multi-core, multi-processor, cluster and 64-bit processor systems [1].

1) It has the ability for real time analysis to enable dynamic management and recombining different networks [5].

2) It has rapid prototyping of protocols & alternative protocols at each layer (Physical layer, Mac layer, etc). QualNet simulator results in fast stimulation of network Parameters, it has got multi stage platform [5].

3) It enables users to design new protocol models and for modifying new and existing models [5].

4) It can design large wireless networks using user designed models [5].

1.3 DISADVANTAGES:-

QualNet do not have many disadvantage but few of them are as follows:-

1) QualNet is not a open source product so difficult for installation in Linux, Windows [6] & very expensive also.

2. PROPOSED METHODOLOGY

We generate a scenario in QualNet 5.0.2 that provide simulation of wireless networks to analyse the performance of different protocols in wireless networks with the help of CBR application, Links, Clouds [7].

CBR mainly keeps the bit rate same throughout the process. Clouds are needed for knowing the different network speed on the traffic which is used in the network. We have taken many nodes in the scenarios and added a wireless subnet and connected the nodes with different traffic generators and with the help of simulation results we have analysed the different output graphs of the networks, Average Jitter(s), Packets delivery ratio, Throughput and End-to-End delay(s) for the protocols [2].

3. RESULTS
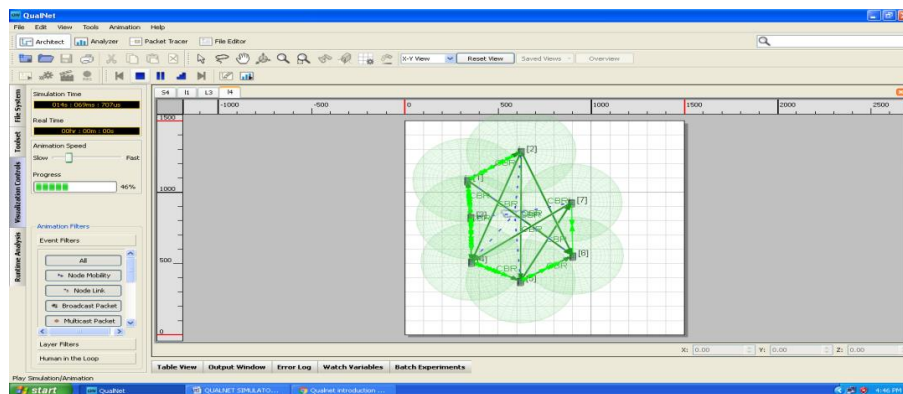
Fig. 3.1 ANIMATION VIEW OF SCENARIO 1

TABLE:1

Simulation Parameters	Values
Number of Nodes	7
Node Placement	Random node Placement
Area	1500*1500
SIMULATION TIME	30 sec
TRAFFIC SOURCE	CBR
Total Bytes Sent By the Nodes [1024] [1025] [1026]	12288 12288 12288

Average Jitter		
[1024]	■	0.003991268 s
[1025]	■	0.016711084 s
[1026]	■	0.016370255 s
Total packets sent		
[1024]	■	24
[1025]	■	24
[1026]	■	24
Total packet received		
[1024]	■	24
[1025]	■	24
[1026]	■	24
Average end to end delay		
[1024]	■	0.028644547 s
[1025]	■	0.162169076 s
[1026]	■	0.176801631 s
Throughput		
[1024]	■	4279 (bits/s)
[1025]	■	4268 (bits/s)
[1026]	■	4330 (bits/s)

Total Bytes Sent by the nodes:- This Parameter tells us about the total no of bytes sent to the nodes. The total bytes sent to the nodes are shown below:-
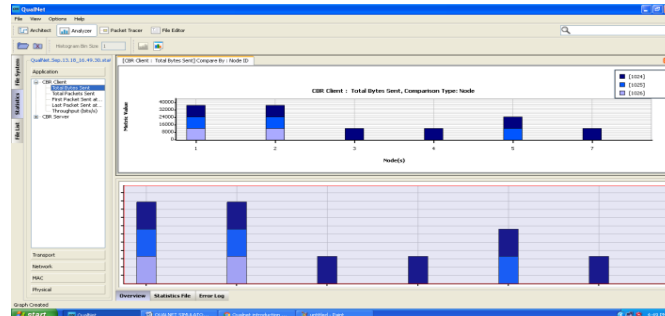

Fig.3.1.1. Total bytes sent by the nodes

Throughput:- It is defined as the total data received at the receiver node from the initiator divided by the time taken to receive the last packets of the network which is measured in bits per second. It is actually how fast we can send data in the form of packets through the network [8].The throughput of the network is shown below:-
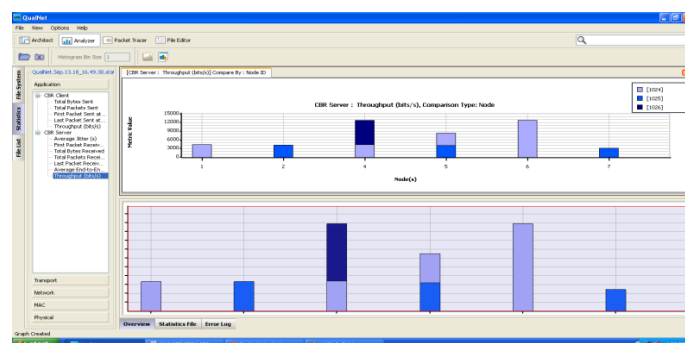
Fig.3.1.2. Throughput (bit/s) comparison graph of the consecutive nodes

Total Packets Sent :- It analyses the total packets. It is a unit of data or information about the different nodes which are sent by the consecutive nodes of the network.
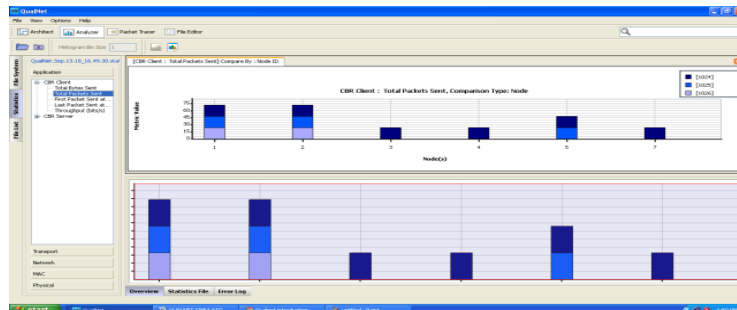

Fig.3.1.3. Total packets sent by the consecutive nodes

Average Jitter:- This parameter basically analyse the variation in the time interval between different packets which are received at the destination nodes, which are caused by network congestion, time drifting. It should be small enough for better performance of the routing protocol. The different analysation of the network is shown below [8].
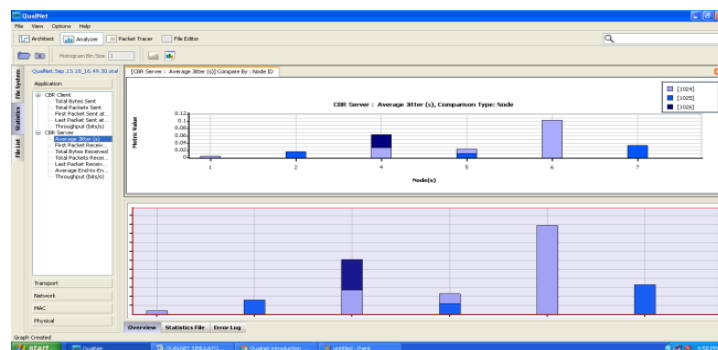

Fig.3.1.4. Average jitter(s) with respect to nodes

Average End-to-End delay:- It basically tells us the time it takes for a packet to travel from the CBR source to the different application layer of the network destination. It represents the average delay when the user transmits data [8].
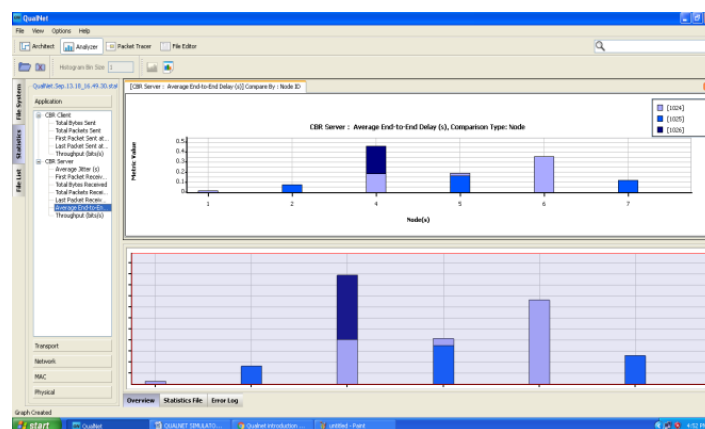

Fig.3.1.5. Average end to end delay(s) with respect to nodes

So basically from the above scenario we can notice one thing as we are connecting the cloud with the nodes the nodes are broadcasting but if we do not connect any cloud with the nodes then the network will not broadcasting network which we are going to see in the next scenario below:-
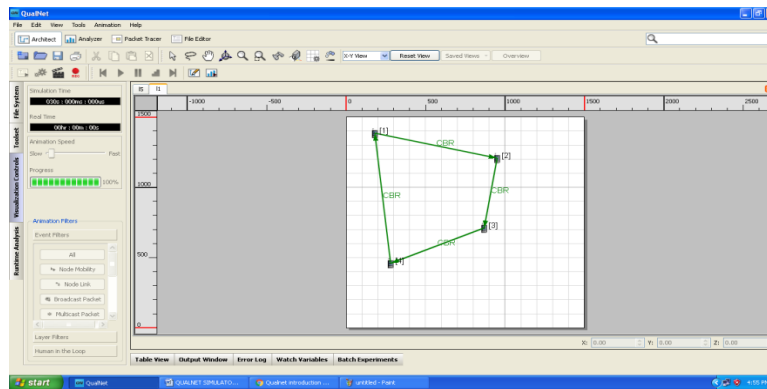

Fig.3.2. ANIMATION VIEW OF SCENARIO 2

TABLE: 2

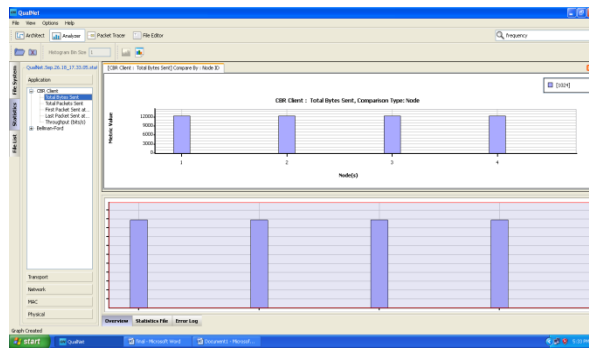| Simulation Parameters	Values
Number of Nodes	4
Node Placement	Random node Placement
Area	1500*1500
SIMULATION TIME	30 sec
TRAFFIC SOURCE	CBR
Total Bytes Sent By the Nodes [1024]	12288
Total packets sent [1024]	24
Throughput [1024]	4274 (bits/s)

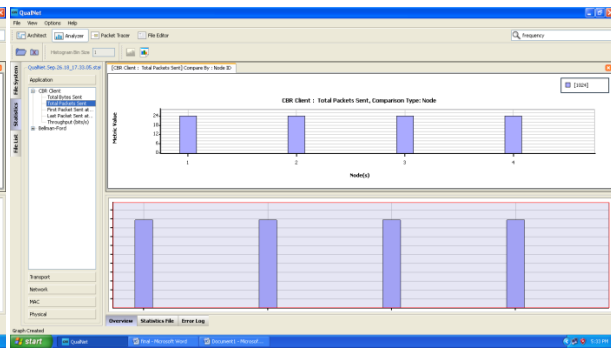Fig.3.2.1. Total bytes sent   Fig.3.2.2. Total packets sent
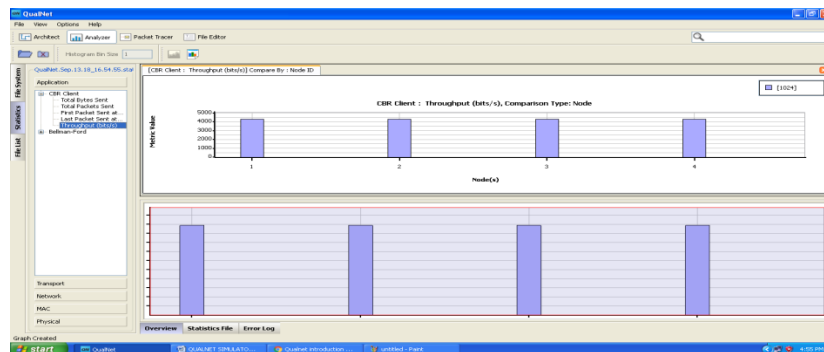

Fig.3.2.3. Throughput (bit/s) with respect to all the nodes

So in the above scenario we noticed that if we do not connect any cloud to the network the network will not broadcast. it describes the access of networking from a centralized third-party provider using Wide Area Networking (WAN).

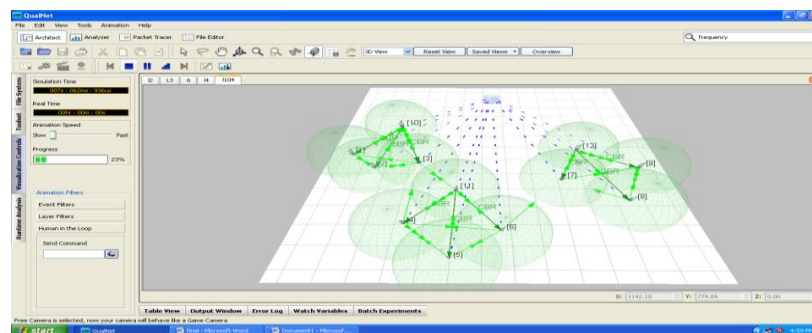## 3-D Visualisation of Simulation Network

Fig.3.3. ANIMATION VIEW OF SCENARIO 3

TABLE: 3

Simulation Parameters	Values
Number of Nodes	12
Node Placement	Random node Placement
Area	1500*1500
SIMULATION TIME	30 sec

TRAFFIC SOURCE		CBR
Total Bytes Sent By the Nodes		
[1024] ■		12288
[1025] ■		12288
[1026] ■		12288
Average Jitter		
[1024] ■		0.006469527 s
[1025] ■		0.006558563 s
[1026] ■		0.010392931 s
Total packets sent		
[1024] ■		24
[1025] ■		24
[1026] ■		24
Total packet received		
[1024] ■		24
[1025] ■		24
[1026] ■		24
Average end to end delay		
[1024] ■		0.017037082 s, 0.005658815 s, 0.015002566 s
[1025] ■		0.045130108 s, 0.029251549 s, 0.023466171 s
[1026] ■		0.062511678 s, 0.040977360 s, 0.031469152 s
Throughput		
[1024] ■		4279 (bits/s)
[1025] ■		3029 (bits/s), 3558 (bits/s), 2828 (bits/s)
[1026] ■		4272 (bits/s)
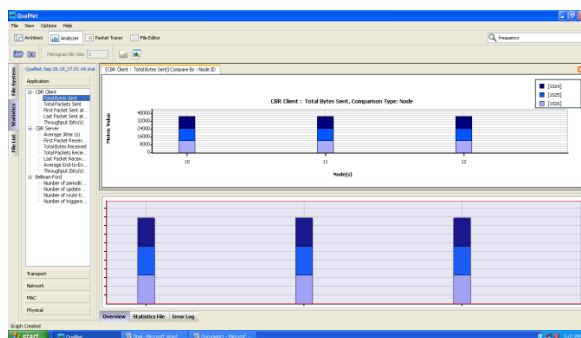
Fig.3.3.1. Total bytes sent

Fig.3.3.2. Total packets sent

Fig.3.3.3. Total bytes received

Fig.3.3.4. Average jitter(s)

Fig.3.3.5. Average end to end delay(s)

Fig.3.3.6. Throughput (bit/s) with respect to nodes

In the above scenario we use nodes randomly but in a particular manner and connecting those with a cloud . The nodes are broadcasting and transmit data from one node to another as shown in the above graphs.

CONCLUSION

So we can conclude that with the help of QualNet Software we can design a large scale networks without any cost in an efficient way, but if we want to create such large networks manually in real life then it may cost a large amount of budgets and also may be the networks which we want to make that will not work properly and efficiently. QualNet helps us for testing the networks beforehand practically so that a huge amount of money do not get lost [7].Without having compare QualNet to other software's we can say that it is a very hel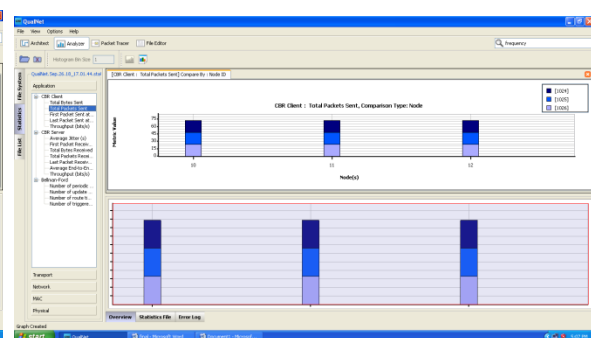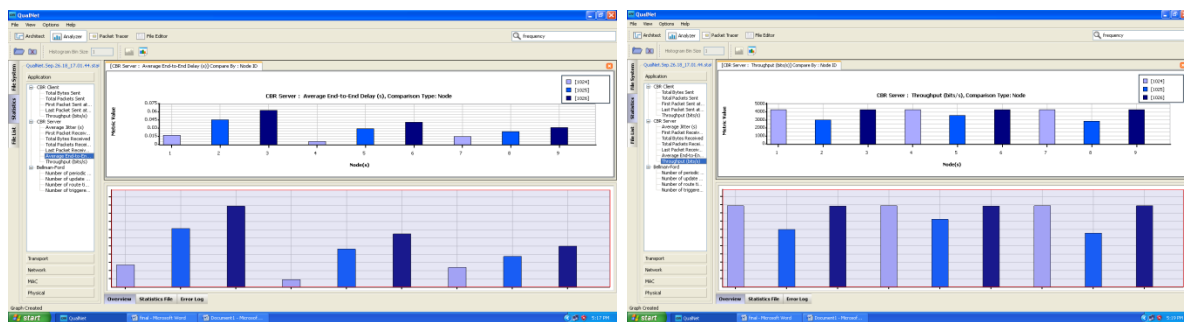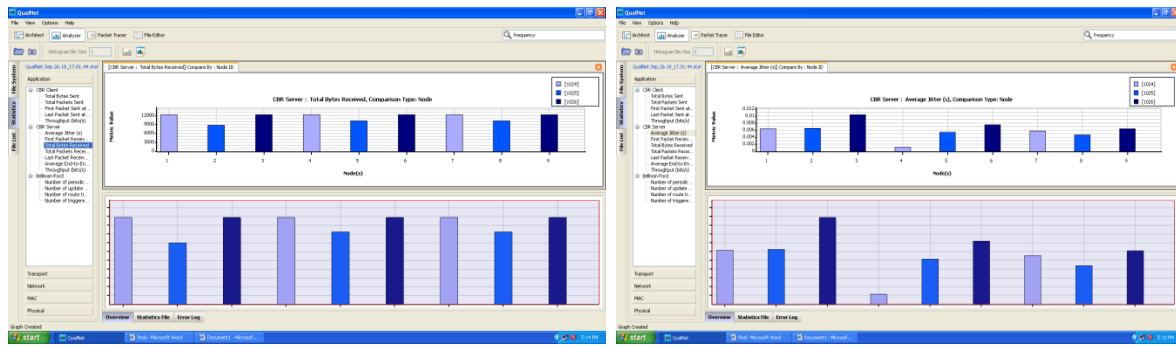pful software for the users. In this software users easily observe one network from the very basic, analyse the network (which can be wireless or not), and also analyse the basic things of the networks very easily. QualNet toolbar gives support for designing the networks, creating and also animating the networks scenarios. The real time statics are also known to the users when this network simulation software is running. It is also very flexible, efficient , fast. This three characteristics together cannot be given by many softwares. In this article we mainly preferred very basic of QualNet and focuses on the average jitter(s), average end to end delay(s), throughput (bits/s), average packets sent and received by the nodes using CBR (Constant bit rate) and LINK (which transmits data from one node to another node).

FUTURE SCOPE

This project we have done practically in the QualNet software and it runs successfully and efficiently. So in future we can design this project in real time which must be a useful cellular network and can be used by everyone. Here we have implemented some wireless networks practically in QualNet software without any expenses. So in future this project will take less time to implement this large scale network.

ACKNOWLEDGMENT

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