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# Delay QoS of Video and Voice over IP at WiMAX Network

**Walaa Abdalla Ibrahim [a], Khalid Hamid Belal [b], Ibrahim Elemam Abdallah [c]**

*a EL Neelain University,Khartoum, Khartuom, Sudan*

*b University of Science and Technology,Khartoum, Khartoum, Sudan*

*Corresponding author E-mail:w.laa202073@gmail.com*

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***ABSTRACT***

In fact, Quality of Services (QoS) is important for any WiMAX or broadband wireless communication, in order to ensure the satisfaction of users. Indeed this paper spots the light on estimating and analyzing two of QoS parameters, which are delay and jitter, where Opnet modular was utilized to create and analyze Wimax network. In fact, the results show that the delay parameter was increased when mobile node number increased, while jitter levelled off.

***Keywords:- WiMAX; QoS; OPNET; Modular; Jitter***

## I. INTRODUCTION

In fact, Worldwide Interoperability for Microwave Access (WiMAX) Known as IEEE 802.16 is a standard for local and metropolitan region networks Stand up for high bandwidth and large number of clients per channel at speeds for instance, nowadays it is observed that in DSL, Cable or a T1; Guarantees to give extent of 30 miles in- exchange for wired broadband like cable and DSL. It might possibly give broadband access to remote places. Utilize point-to-multipoint (P2MP) design.As matter of fact, WiMAX intended for Transferring broadband connectionless multimedia services to the end users. WiMAX includes the knowledge of Wi-Fi with the mobility of cellular that will carry personal mobile broadband that gets about with you [1].

Moreover, It is worth mentioning WiMAX is a universal broadband wireless standard the question of whether or not it might substitute either DSL or Cable will be different from area to another. In this sense, many creating nations essentially don't have the infrastructure for backing either cable or DSL broadband technologies. In fact, a large number of these countries are used extensively broadband wireless technologies. Even in these areas, Cable or DSL technologies would improbable to absent oneself. In this context, the business case and essential infrastructure regularly manage that the least expensive arrangements will prevail. In numerous zones in creating countries, it might be less expensive to convey Cable and DSL in the urban areas at any rate for settled applications, though WiMAX will command outside of significant towns [2]. WiMAX gives network operators the chance to give many services to draw in a layered scope of endorsers.it present a different of flow kinds that may be utilized to optimize performance for voice, data, and video. Effective voice over IP (VoIP) communications needs QOS characteristic Which can be determined quickly voice traffic and categorize and set the priority of implementation to ensure high quality audio and Commitment level of service[3].

## II. RELATED WORKS

The author [4] examined VOIP over WiMAX network and evaluated the performance for QoS Using OPNET modeller. They made different scenarios to calculate the performance of a different number of the node. They found that when nodes increase the delay will increase.

The author [5] made a review on different WiMAX QoS parameters which influence the execution of a WiMAX network in different scenarios. The review proposes that these basic QoS parameters are basic in underlining the execution of a WiMAX organizes. The creator analyzed various basic QoS parameters like throughput, packet loss, average jitter and average delay for VOIP and Video activity utilizing ns 2 simulators. The simulation showed that UGS has most reduced esteems for these QoS parameters.

The author [6] made paper to test VoIP over WiMAX network and Evaluation of Voice over IP Performance using the OPNET simulator. They made various scenarios to calculate the evaluation of various VoIP Codec performances by taking the performance metrics such as packet end to end delay, MOS and jitter. They show that jitter increases considerably in the stationary network when in the network silence suppression and when mobility is introduced in the network then the packet end-to-end delay decreases considerably.

Quality of service definition and it is more important parameters. The quality of the service is defined as the capability of the network to provide better services to different users. it relies on the application and the utilization to which end client. It utilizes a scope of

 

measurable performance metrics such as Bandwidth, Latency, Jitter, throughput, packet delivery ratio, packet loss ratio[7, 8]

Indeed delay or latency might be defined as the time which the packets spent to arrive from the source to target. The primary sources of delay can be sorted into Propagation delay, source processing delay, network delay and destination processing delay.The delay can be calculated using the following formula:

$$D = \sum_{i=1}^{N} \frac{d_i}{N} \qquad (1)$$

In fact, Jitter could be named as the variety in delay or packet delay variation. The estimation of jitter is computed from the end to end delay. Measuring jitter is a basic component of deciding the performance of the network and the QoS the network offers it is the variety in the time between packets arriving. Jitter is ordinarily utilized as a pointer of consistency and stability of a network.The jitter can be calculated using the following formula:

$$J = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(d_i - D)^2} \qquad (2)$$

## III. QUALITY OF SERVICE CATEGORIES

Originally, five different service types were supported in the 802.16 standards are UGS (Unsolicited Grant Service),rtPS (Real-Time Polling Service),nrtPS (Non-Real-Time Polling Service), BE (Best Effort),ertPS (Extended rtPS) more important of them are UGS :It is like CBR (Constant Bit Rate) service in ATM.Which creates a steady size burst periodically. This service can be employed to substituteT1/E1wired link or a steady rate service. As well it can be utilized to upholding real time applications like VoIP or streaming applications.

However, UGS is simple and may not be the best option for the VoIP in that it can spend time while the voice call is stopped.rt PS: It supports a variable bit rate real-time service such as VoIP. Each polling interval, BS polls a mobile and the polled mobile sends bw-request (bandwidth request) if it has information to transfer[9].

## IV. SIMULATION STEPS

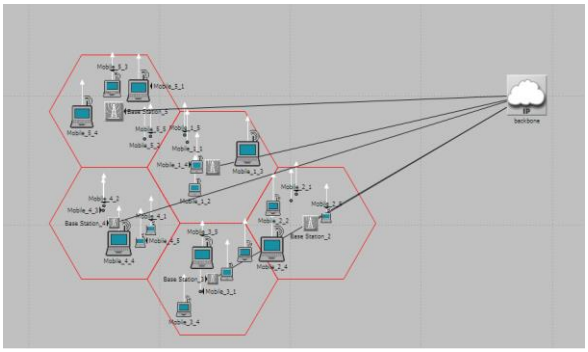

Figure (1): WiMAX Network Design

Factually in this paper, we simulate WiMAX network which serves VoIP and video using an OPNET modeller on account of gives a good environment for simulate different networks with various scenarios. Actually, we have design five scenarios in our WiMAX ne which are shown below:



- In scenario 1 A wireless topology (WiMAX) was deployed and 5 mobile nodes configured for every 5 cells and Adaptive modulation is chosen as a modulation technique.
- In scenario 2 is similar to scenario 1 in it is configuration but the number of mobile nodes was increased to 50
- In scenario 3 same configurations were done and the number of the mobile nodes was increased to 75.
- In scenario 4 the same network was designed with 100 mobile nodes.
- Scenario 5 a final scenario is same as above scenarios but the number of mobile nodes was increased to 125.
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## V. SIMULATION RESULTS AND DISCUSSION

Originally delay or latency might be defined as the time which the packets spent to arrive from the source to receiver. With respect to the designed network, we have calculated delay which was measured during 10 min that represents the time taken by the packets to reach from source to destination. The results of five scenarios were put on the Table (1) and Figure (2) :

Table(1):Delay values in five scenario

| *Scenario.NO* | *Delay/sec* |
|---|---|
| *Scenario 1* | 0.38 |
| *Scenario 2* | 0.4 |
| *Scenario 3* | 0.51 |
| *Scenario 4* | 0.51 |
| *Scenario 5* | 0.48 |

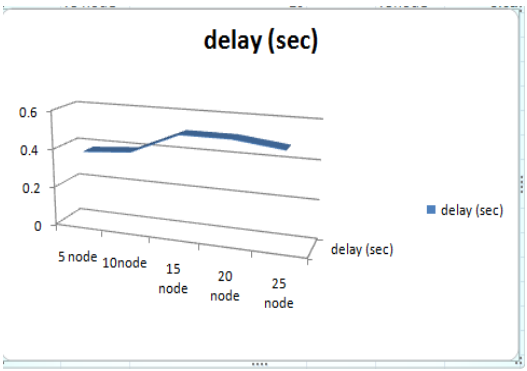


Figure (2): No mobile nodes in each cell

From the results in Table (1) and Fig (2) shown that the average value of delay increased when the number of mobile nodes increased as shown in fig (3).

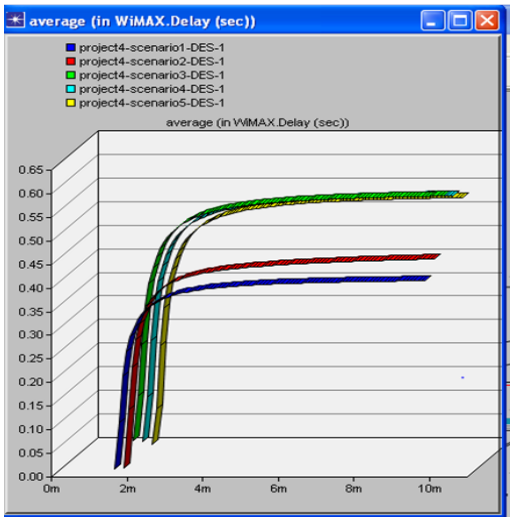


Figure (3): WiMAX Delay (sec)

The delay was measured in various time intervals (10 min-20 min-30 min)to show the value of delay vs. time and the result shows that the value of delay was increased when duration time of simulation was increased that shown in figure (4).

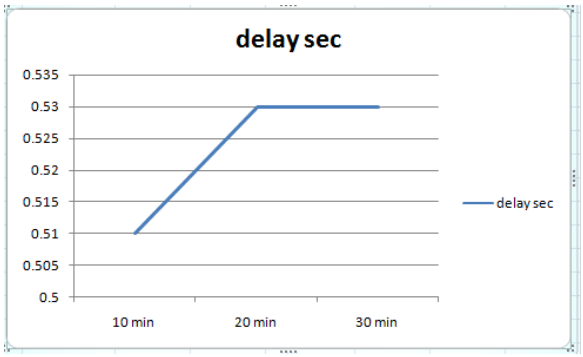


Figure (4): Delay vs. time

Jitter: Jitters defined as the variety in delay or packet delay variation. Indeed the estimation of jitter is determined from the end to end delay. With regard to the designed network, we have calculated jitter which was measured during 10 min that represents the time taken by the packets to reach from source to destination. The result of five scenarios was put on the Table (2) and Figure (5).

Table (2): jitter values in five scenarios

| Scenario.NO | Jitter/sec |
|---|---|
| Scenario 1 | 3.9 |
| Scenario 2 | 5 |
| Scenario 3 | 5.8 |
| Scenario 4 | 5.4 |
| Scenario 5 | 3.9 |

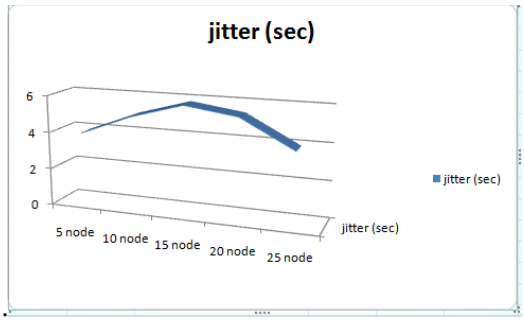


Figure (5): Jitter vs No of mobile nodes in each cell

From the results in Table(1) and figure (5) shown that the average value of jitter is unstable because it was increased in scenario two and three then it was decreased in scenario four and five that occurred during of first 2mins then all the values became equal as shown in Figure (6).

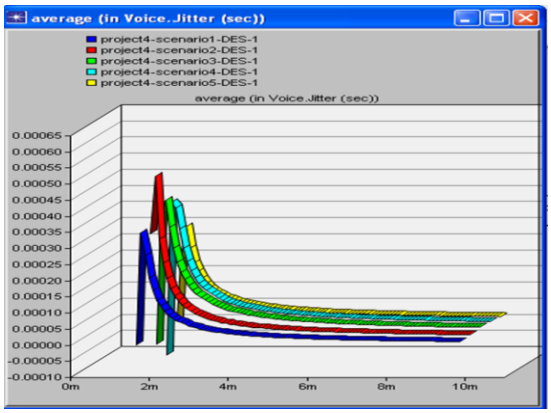


Figure (6): WiMAX jitter (sec)

Indeed jitter was measured in various time intervals (10 min-20 min-30 min)to show the value of jitter vs. time and the result was found is the value of jitter was decreased when duration time of simulation was increased that shown in Figure (7).

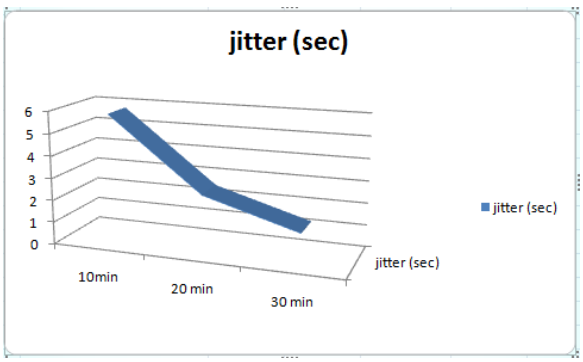


Figure (7): Jitter vs. Time

## VI. CONCLUSION

To conclude, the quality of the service is defined as the ability of the network to provide better services to various users, it is more important for all broadband wireless networks. Factually QoS have many parameters such as packet loss, jitter, delay and so on in our paper delay and jitter was discussed.

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