

Throughput QoS of Video and Voice over IP at WiMAX Network

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ABSTRACT

This paper examines WiMAX network assessed the performance for quality of service. OPNET modeller was used to creating a network and computer the quality of service parameters Throughput and Mean Opinion Score (MOS) value, which was texted. In fact, the result found that when mobile node number increased the highest value of MOS was achieved and throughput was increased.

Keywords— OPNET; WiMAX, Throughput; MOS Value, QoS.

I. INTRODUCTION

WiMAX (IEEE 802.16 technology) is wireless broadband access technology which based on IP. It gives a performance like 802.11/Wi-Fi systems with the coverage and QoS (quality of serves) of cell systems[1], so WiMAX characterized by its strong quality of service, thus providing a better quality of interactive multimedia services[2].

Indeed this technology is a promising alternative to local wireless networks and 3G networks. It offers multiple frequencies and protocols, uses highly efficient services, provides coverage of large areas, low cost and high data transfer rates in multimedia (data, audio, video and Pictures) exchange between users as they use radio waves as a transmission medium[1, 3]. WiMAX Technology is confronting many obstacles in the market while it has some incredible points of interest which make it a technology of today[4].

II. RELATED WORKS

Author in [5] arranged to comparative study of the performance of VoIP over wireless networks using OPNET tool. The simulation study is completed by running VoIP application in various network scenarios with IEEE 802.16 (UGS, ERTPS) and IEEE 802.11 (b, g) with best effort service and interactive service. They found that the WiMAX type extended real-time Polling Service (ERTPS) has the best performance between all examined cases.

Author in[6] review paper examined QoS in WiMAX network, the paper shows that the vast majority of the analysts give careful consideration for QoS parameters in particular are, Jitter, throughput, packet loss ratio and packet delivery ratio. These parameters constitute the most imperative QoS measurements in WiMAX network.

Author in [7] contribute to general simulation utilizing OPNET modeler to evaluate the performance of WiMAX for upholding VOIP traffic, they compare between QoS classes Best Effort(BE), Extended real time Polling Service(ERTPS), Non-Real Time Polling Service (NRPTS), Real-Time Polling Service(RTPS), improved ERTPS .they found that ERTPS is the best one because of lower delay performance.

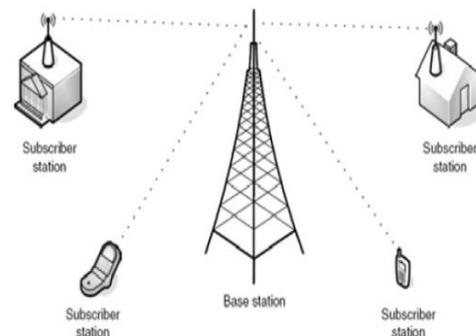


Figure (1): WiMAX System Structure

They are two parts in WiMAX system: WiMAX tower the concept of it is similar to its counterpart in cellular systems. Indeed, only one WiMAX tower can cover a huge area that can reach more than 3,000 square miles (~8,000 square km). WiMAX receiver The antenna and receiver in the WiMAX systems are in the form of a small box or card and sometimes they are built inside the laptop devices as is the case now in the Wi-Fi systems.

Factually, WiMAX tower stations have to be connected to the Internet directly and by using wired connections with a high bandwidth. When connecting the WiMAX tower with another one

occur using a line-of-sight, microwave link. This connection to a second tower. As the matter of fact, WiMAX network is made to cover a whole area, compared to the complex wire network. Eventually, the expected combination of WiMAX and CDMA called the fourth generation wherefore WiMAX considered the next step in the development of cellular phone technology [2].

The technology used in WiMAX networks is Orthogonal Frequency Division Multiple Access (OFDMA). Its spectrum ranged from 1.25 MHz to 28 MHz it uses both times Division Duplexing and Frequency Division Duplexing. It is antenna used advanced techniques like MIMO. WiMAX uses adaptive modulation. It has Strong security.

III. MULTIMEDIA OVER WIMAX

In fact, the main idea of multimedia streaming is to transfer a variety of desired media to users by the network and display them to users. Real time and interactive audio/video include client and two servers. Eventually, WiMAX has the capacity to convey broadband speeds more than 70Mb/s in an effective way. Actually, a modern QoS plot is required a real time Experiment of voice and Video applications [4].

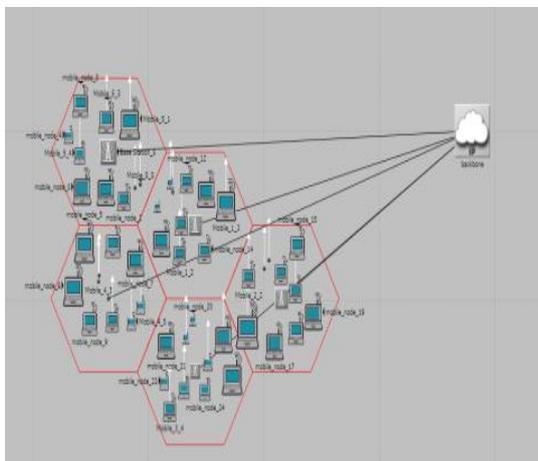


Figure (2): The design of WiMAX network

IV. RESULTS AND DISCUSSION

Throughput is defined as determining of a number of packets that actually delivered in the network. In connection with designed network throughput was compute which measured during 10 min that represents duration time of simulation. The results of five scenarios were put on the Table (1) and Figure (3).

Table (1): Throughput values in five Scenarios

No. Nodes	Throughput(packet/sec)
25 node	7.3
50 node	5
75 node	10
100node	9.5
125 node	9.9

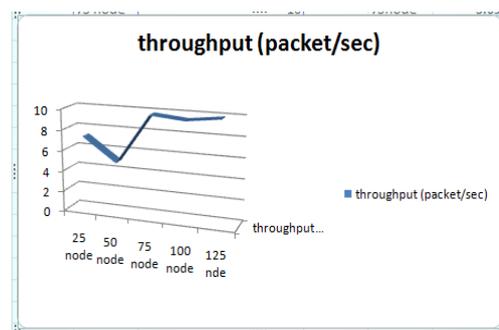


Figure (3): Throughput versus no of mobile nodes

From the results in Table (1) and Figure (3) shown that the average value of throughput increased when the number of mobile nodes increased as shown in Figure (4).

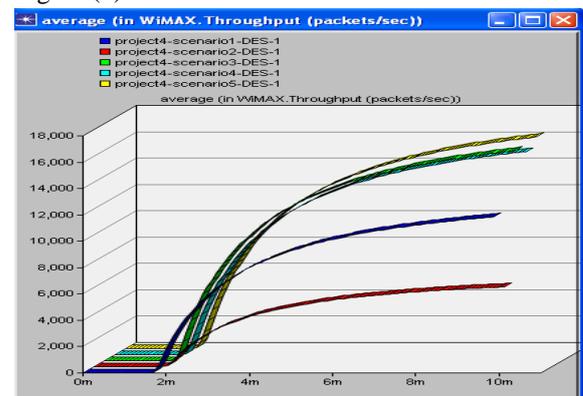


Figure (4): WiMAX Throughput (packet/sec)

In fact, throughput was measured in various time intervals (10 min-20 min-30 min) to show the value of it vs time .the result was found that the value of throughput was increased when duration time of simulation was increased that shown in Figure(5).

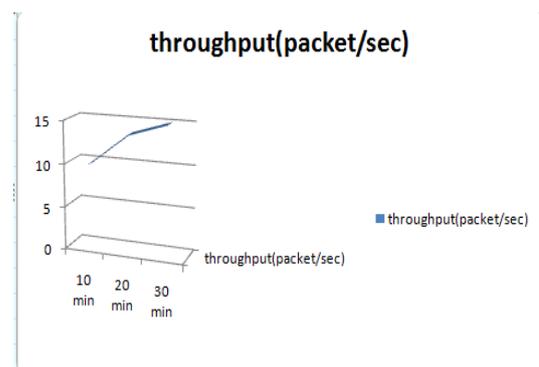


Figure (5): Throughput versus Time

Mean Opinion Score (MOS): MOS gives a numerical measure of the quality of human speech in voice telecommunications, with value scale from 1 to 5 where 1 is a bad quality and 5 is the best quality as shown in Table (2)

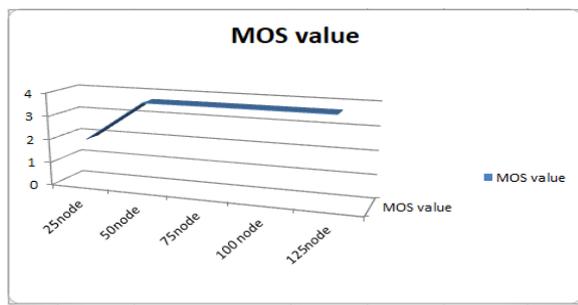
Table (2): Mean Opinion Score

Quality Scale	Score
Excellent	5
Good	4
Fair	3
Poor	2
Bad	1

With respect to designed network MOS value was computed in five scenarios during 10 min that represents duration time of simulation. The results were put in Table (3) and Figure (6).

Table (3): MOS values in five scenarios

No. node	MOS value
25node	1.96
50node	3.69
75node	3.69
100node	3.69
125node	3.69



Figure(6): The result of MOS values versus no of mobile nodes

From the results in table (3) and figure (6) shown that the average of MOS value in scenario1 is poor quality then increase in scenario 2 it become good to some extent and continue in these value in scenario 3,4 and 5 we can say when the number of mobile nodes increased the MOS value is improving as shown in figure (7).

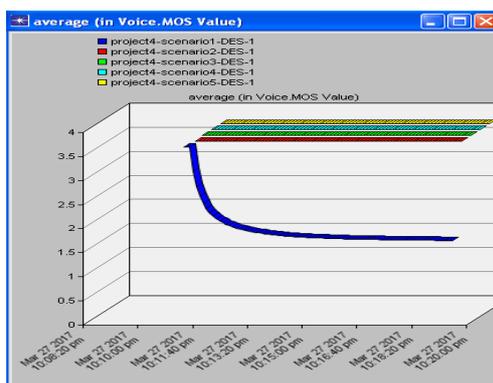


Figure (7): WiMAX MOS Value versus time

MOS value was measured in various time intervals (10 min-20 min-30 min) to show the value of it vs. time and the result was found that the value of MOS value was fixed when duration time of simulation was increased that shows in Figure(8).

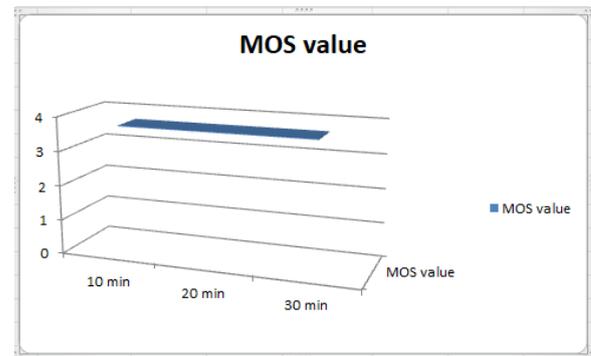


Figure (8): MOS Values versus Time

V. CONCLUSION

Actually, this paper was indication and performance evaluation of QoS in WiMAX network. OPNET Module is used to simulate the network and determine the performance parameters (throughput, MOS value). The result demonstrations that throughput increased and MOS value was improved depend on increasing of number of users so the optimum value of QoS was gained.

REFERENCES

- [1] S. Q. S. Alshomrani, S. Jan, I. Khan and I. A. Shah, "QoS of VoIP over WiMAX networks," *International Journal of Computer Science and Telecommunications*, vol. 3, pp. 92-98, April 2012.
- [2] S. P. Gyan Prakash, "WIMAX TECHNOLOGY AND ITS APPLICATIONS," *International Journal of Engineering Research and Applications (IJERA)*, vol. 1, pp. 327-336.
- [3] A. V. W. a. U. D. D. R. K. Jha, "A Survey of Mobile WiMAX IEEE 802.16 m," *International Journal of Computer Science and Information Security*, vol. 8, pp. 125-131, 2010.
- [4] M. S. a. M. Othman, "IEEE 802.16: WiMAX Overview, WiMAX Architecture," *International Journal of Computer Theory and Engineering*, vol. 5, pp. 784-787, October 2013.
- [5] H. S. A. M. Sllame, Mona Aown, L.Abdelmajeed, "A Comparative Study of VoIP over IEEE 802.11(b, g) and WiMax (UGS, ertPS) Wireless Network Technologies," *International Journal of Wireless Communications and Networking Technologies*, vol. 5, August - September 2016.
- [6] A. B. A. N. M. Abozar Ahmed Mukhtar Ahmed "QoS for WiMAX Networks: A Review Paper," *International Journal of Engineering, Applied and Management Sciences Paradigms*, vol. 20, December 2014.
- [7] N. M. Anita Mishra, Harsukhpreetsingh, "Performance Evaluation of WiMAX network with High QoS services incorporating Different physical and Mac layer slanders," *International Journal of Application or Innovation in Engineering & Management (IJAIEM)* pp. 183 – 189, April 2015.