International Journal of Engineering Sciences Paradigms and Researches (IJESPR)
(Vol. 34, Issue 01) and (Publishing Month: September 2016)
(An Indexed, Referred and Impact Factor Journal)
ISSN: 2319-6564
www.ijesonline.com

Throughput Performance Evaluation of VoIP over WiMax Network

Rowida Altaher Abdalazziz Ahmed[1], Dr. Khalid Hamid Bilal[2] and Dr. Mustafa Mohammed Alhassan[3]

[1,3]Department of Communication, Faculty of Engineering, Al-Neelain University, Khartoum, Sudan
[2]University of Science and Technology, Khartoum, Sudan

Publishing Date: September 18, 2016

Abstract

Telecommunication had been the researchers discuss and make a numerous changes in the recent years, especially in the development of mobile broadband. Cellular systems accommodate a large number of mobile units over a large area within a limited frequency spectrum. This paper focuses on study of Throughput Performance Evaluation of VoIP Over WiMAX Network using OP-NET software programming for different scenarios, the parameter which were taken in to Consideration of the Evaluation were number of calls and power. For The results, we observe that when the number of celles is increased and the power is 5 watt the ratio of the throughput is increased. The results show that best quality of service is achieved by using many services designed for specific applications.

Keywords: *VOIP, OPNET, QoS, WiMAX. Throughput.*

1. Introduction

Nowadays Worldwide Interoperability for Microwave Access (WiMAX) Technology is one of the most interesting solutions for broadband wireless access that provide multimedia traffic and applications through an appropriate QoS management for fixed and mobile devices. The IEEE 802.16 technology (WiMAX) standard can be applied in point-to-point or mesh topology using couple of directional antennas to increase the activity range of the system, comparative to what can be achieved in the point-to-multipoint mode. WIMAX is a solution to the outdoor broadband wireless access that is competent of transferring high-speed streaming data. It has the capability of delivering high-speed services up to a range of 30 miles [1]. IEEE 802.16 uses multiple channels for a single transmission and supply bandwidth up to 100 Mbps. The use of orthogonal frequency-division multiplexing (OFDM) increases the bandwidth and data capacity by spacing channels very close to each other and avoids interference by orthogonal channels [2]. Voice over Internet Protocol (VoIP) is an alternative technology to Public Switched Telephone Network (PSTN) that permit delivery of voice traffic over the Internet and provides low cost, good quality and modern telephony. Many VoIP applications are available on the internet for examples: Skype, Viber, Tango, and Yahoo messenger [3].

The Quality of Service Parameters (QoS) with techniques such as Internet Protocol being used End to End delays, jitter, Packet loss, throughput. The Throughput is known as the rate packets that were successfully delivered through the channel communication to the destination, it is usually measured in bits per second (bit/s or bps).

Many studies have been conducted in WiMAX to evaluate and analyze the VoIP performance, one closely related work was published the authors in [4] the authors evaluated the performance of VoIP Codecs over WiMAX /Wi-Fi integrated network. The authors in[5] focuses on analysis of quality of service in WiMAX networks .It presents the details of the quality of service architecture in WiMAX network, is used Various real time scenarios like voice call, video streaming are setup in the simulation environment. Parameters that indicate quality of service is throughput, packet loss, average jitter and average delay, are analyzed for different types of service flows as defined in WiMAX. In [6] the alow have proposed a traffic-aware scheduling algorithm for VoIP applications in WiMAX networks. They have studied the performance of their proposed

method and compared it with that of some conventional methods. They have discussed the trade-off between delay and bandwidth efficiency and it is shown that using their scheduling methods enhances the efficiency of VoIP over WiMAX.

2. Description Analysis

In the real-time WIMAX scenario; the network models are designed in a well-organized and its performance evaluation is great importance. To design and simulate network models, OPNET has an extensive built-in structure of development environment. For the experimental evaluations, the OPNET Modeler has been used in the thesis work with WIMAX Module capability. We designed two scenario cell scenario including 1,3,5,7 and 9 cells and the power scenario varies from 0.5,1,5,10 with 15 node in each scenario for voice conference to the Codec'. G711, as well as meet the goal to analysis the quality voice over the internet protocol in WIMAX network for successful transmission.

3. Mathematical Model

The Quality Of service (QOS) of WIMAX of codices G711, Wimax network is measured of evaluated in terms of Throughput which are theoretically given by:

$$\text{Throughput} = \frac{\text{No Of Deliverd Packet X Packet Size (Byte) X 8}}{\text{Total Simmulation Time (sec)}} \quad (1)$$

4. Computer Model

The descriptive analysis and mathematical model where modeled as computer model in flow char algorithm as shown in figure (1):

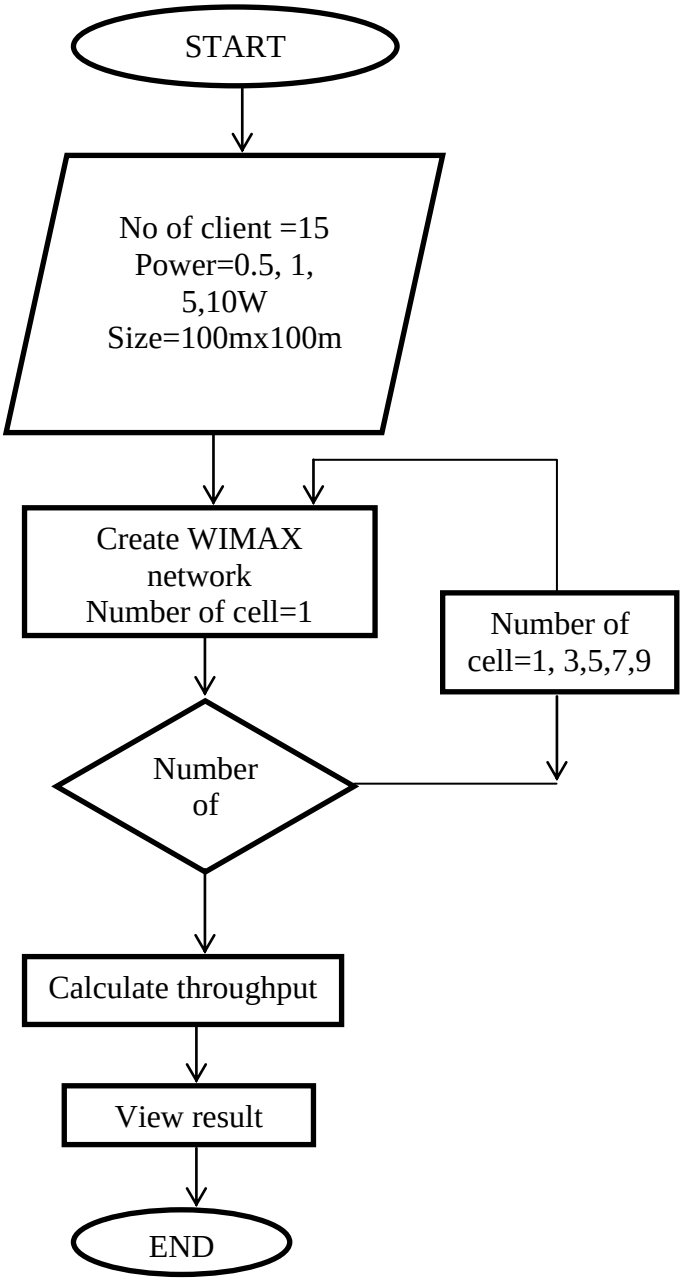

Figure 1: Number of Cell Scenario Model

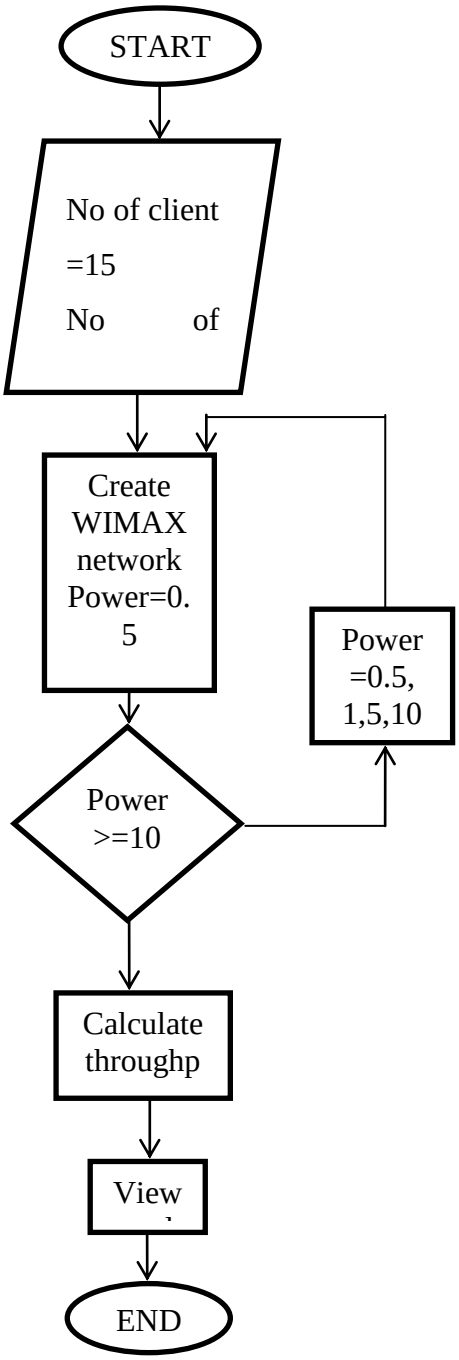

Figure 2: Power is Scenario Mode

5. Simulation Environment:

The parameters which were taken in to consideration of evaluation of Throughput of Wimax network where shown in table below:

Table 1: Simulation Environment

Parameter	Value
Network	WIMAX
Area	50 KM
Number of nods	15
Number of cell	1,3,5,7 and 9
Cell radius	2Km
Power	0.5,1,5,10
Bandwidth	900GHZ
Simulation time	1 min
Voice coder	G.711

5.1 Simulation

Figure (3): The computer was implemented using OPNET software program as shown:

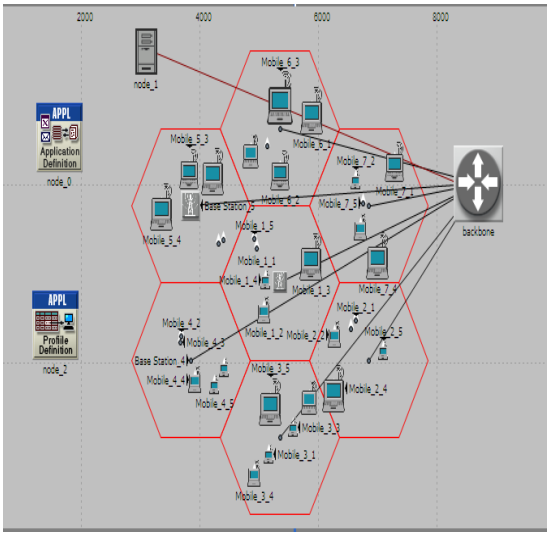

Figure 3: Wimax model using 7 cells with 15 users

6. Results

After execution of simulation we get the result in form of tables and graph as follows:

Table 2: Throughput Vs number of cell

Number of cell	Throughput
1	10.0466
3	65.3611
5	83.3960
7	183.0363
9	186.4503

Average (throughput) = 105.6581

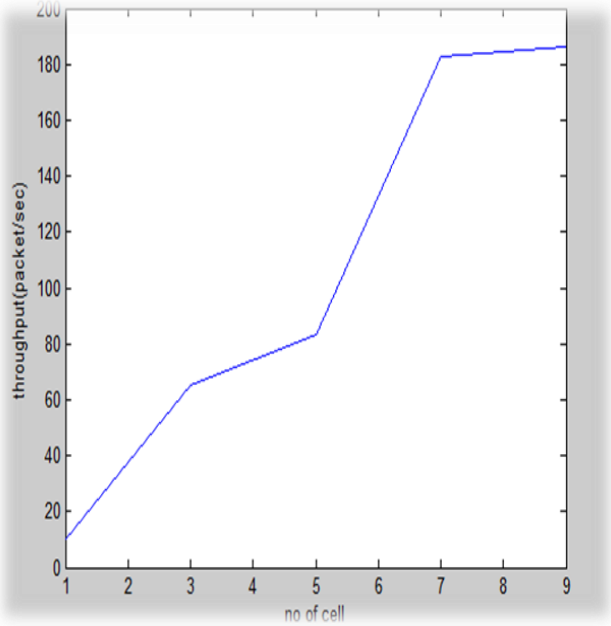

Figure 4: A Plot of Throughput Vs number of cell

Table 3: Throughput Vs power

Power	Throughput
0.5	65.3611
1	24.4158
5	32.2366
10	79.5730

Average (throughput) = 50.3966

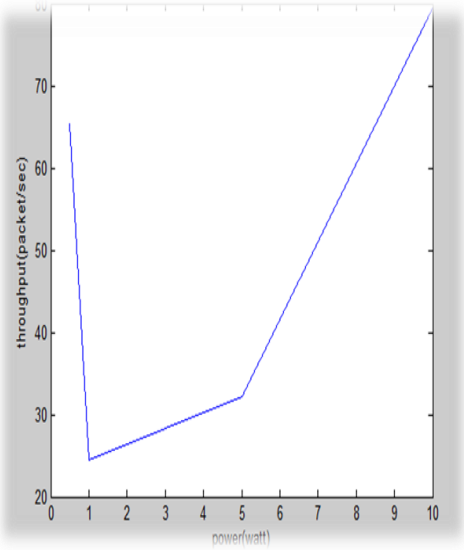

Figure 5: A plot of throughputs power

7. Result Discussion

The results from table (2) and Figure (4) we observe the throughput is in high ratio and the ratio of the throughput is increasing when number of cell is increasing. The average of throughput is (105.6581pps). The results from table (3) and Figure (5) we observe the throughput is decreasing when the power is 1 watt, and it increasing proportionally when the power is increasing. The average of throughput is (50.3966 pps).

8. Conclusion

In this implementation, we evaluated the performance of VOIP over WIMAX by using OPNET software. We studied and discussed the throughput performance for VoIP in Wimax network in different scenarios, and then compare and analyzing the results to evaluate the performance of VoIP. We found that when the number of cell is increased and the power is 5 watt the ratio of the throughput is increasing. The results show that best quality of service is achieved by using many services designed for specific applications.

References

[1] Al-Imran, Ajayi Oluwafemi SAMUEL "Evaluation of Video Quality of Service in 3G/UMTS Wireless Networks as Succor for B3G/4G Wireless Network" Master Thesis in Electrical Engineering with Emphasis on Telecommunications, May 2010

[2] Sayed Ahson Mohammad Ilyas, "WIMAX", 2008.

[3] Y. Jung and C. Manzano, "Burst packet loss and enhanced packet loss-based quality model for mobile voice-over Internet protocol applications," Journal of IET Commun., Vol. 8, Iss. 1, pp. 41–49, 2014.

[4] Dulal Chandra Mondal ,Iti Saha Misra, Sounak Basu -Performance Evaluation of VoIP Codecs over WiMAX/Wi-Fi Integrated Network- 2012- international Journal of Computer Applications (0975 – 8887) .

[5] Rohit Talwalkar "Analysis of Quality of Service (QoS) in WiMAX Networks" May 2008.

[6] E. Haghani and N. Ansari, "VoIP traffic scheduling in WiMAX networks," in Global Telecommunications Conference, 2008. IEEE GLOBECOM 2008.