

Evaluation of Wimax Handover Mechanism

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Abstract

Wireless networks are changing in different aspects such as continuous speed, data rates and quality of service. These aspects are required to be adaptable by the different technologies and service providers. Consequently, Worldwide Interoperability for microwave access (WIMAX) is one of the future generation networks (4G) that needs further study. The major consideration of WIMAX is to achieve mobility for handover mechanism that concern with the mobile station movement within the range of network coverage from one base station to another homogeneous and different homogeneous networks. In this paper, we will analyze the handover mechanism in WIMAX followed by comparisons to WIMAX performance with the existing network as WIFI network. Qualnet is used for this comparison of networks.

Objective

Evaluation of WIMAX mobile network by performing handover process to new base station. WIMAX is the 4G network to cover the consumer's needs. WIMAX technology is emerged from the IEEE 802.16 with WMAN standards. 802.16e is support mobility for mobiles moving in the range of 2-6 GHz. Mobility is unique in every network. 802.16e is developed by using Orthogonal Frequency Division Multiple Access [1]. Mobility models are classified into 4 types depend on the restrictions and dependences. Random based, Temporal & Spatial dependencies, Geographical restrictions. Main objective of this paper is to compare the WIMAX network performances with the existing UMTS and WI-FI wireless networks by using end to end delay and throughput.

Literature Review

The mobile WIMAX network is built around an IP core based on advanced technologies and protocols that provide the needed QOS and security features. This supports WIMAX to voice over IP which is popular in enterprise networks. The unique feature of the WIMAX is the it operate in the unlicensed band which leads to

cost effective to be used in campus area networks such as airports ,military bases and universities.WIMAX networks supports fixed, portable, mobile wireless broadband connectivity without line of sight with a base station.Several performance studies were done on 802.16e.Example,the authors in [7] conducted modeling of 802.16e on mac layer for VOIP traffic.in another example they proposed handoff mechanism for WIMAX mobile users. In [2] the authors conducted aevaluation study of WIMAX system using directional antennas to improve its performance.

Detailed problem definition:

There are number of factors in mobility for communicating devices such as portability, roaming, mobility with great speed. Communication devices such as mobile phones, laptops capabilities are getting more complex that are supplied by the service provider like audio/video streaming are more desirable[1].To overcoming the mobility problem take a comprehensive study of the mobile WIMAX network. Consequently on one side, knowing the how WIMAX provides to intra-network mobility, and on other side ,the handover mechanism is the important in the mobile WIMAX .so many authors elaborate a handover in simulated the handover with in a one network[3,4].

Solution methodology:

In this paper we are done comparing WIMAX network with the existing network wi-fi network. However WIMAX is the new technology ,it is difficult to comparison realistic manner under specific area with specific circumstances. Because of the lack of practical experience with WIMAX. For this reason we are going to simulate the results in a network simulator tool.

The simulation of the handover mechanism in mobile WIMAX network is implemented in Qualnet 5.0 simulator. For this simulation we consider three performance metrics they are throughput, end –to-end delay, jitter with in WIMAX network. This results are compared with the results obtained from the WI-F and UMTS networks.

Details of experimentation, analysis: The three performance metrics are Throughput, end-to-end delay, jitter.

Throughput:

Average Throughput is defined by the ratio of total amount of data is transferred to the time taken for the data to transform from the source to destination. Throughput is described by bytes or bits per second.

$$\text{Throughput} = \frac{\text{totalbytesreceived} * 8 [\text{bits}]}{\text{endtime} - \text{start time}}$$

End-to-End delay

It is defined as the time taken for a packet to transfer from source to destination. It mathematically represented by following manner.

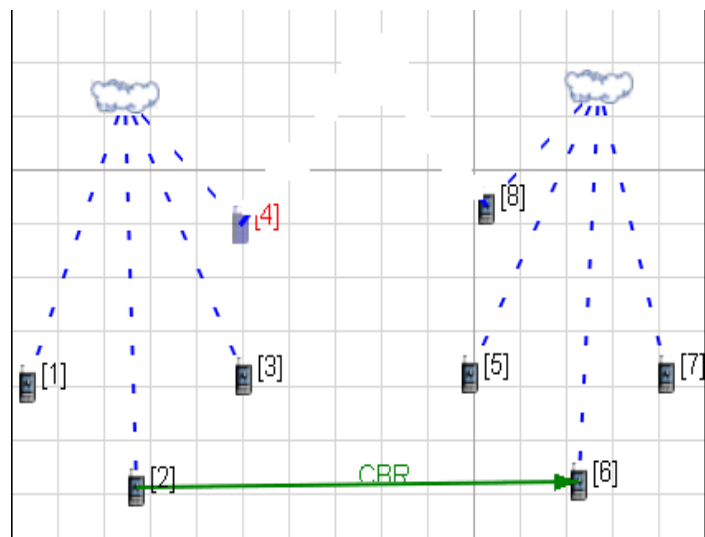
$$\text{End-to-End delay} = \frac{\text{Totalend-to-endl delay}}{\text{Noofpacketsreceived}}$$

Jitter

Jitter is the time taken by the packets to reach the destination side ,caused by network timing drift, congestion, timing drift, route change. It defines the packets from the source to destination with different delays. A packet delay can change by the different accepts . Mathematical equation is described below

$$\text{Jitter} = \text{Reception time of packet}(I) - \text{Reception time of packet}(I-1)$$

The following diagram shows the snapshot of qualnet simulator



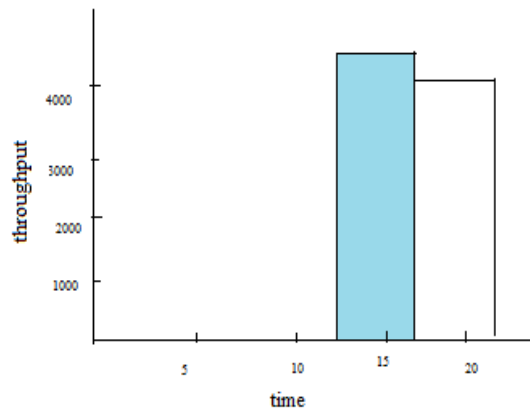
Results and Discussions

Results are obtain from the qualnet simulator. Throughput , End-2-delayand jitter of each simulated environment.

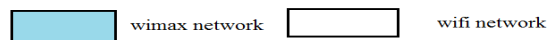
Throughput result:

Average throughput is defined as the ratio of data is transferred to the time taken for the data to transform from the source to destination.

Throughput of WIMAX –WIMAX networks is high when compared to the wi-fi network. The following diagram shows the throughput results. The throughput of wimax in greater than the wifinetwork .

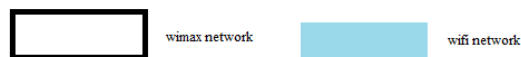
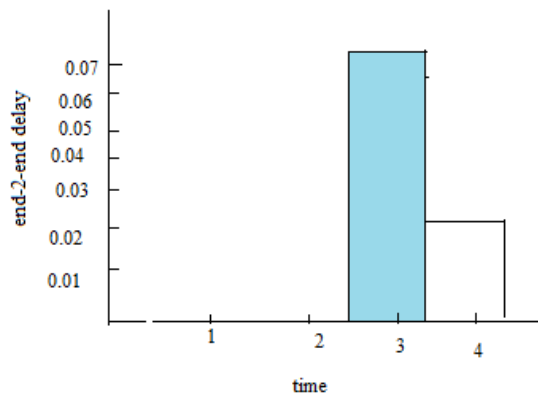


Throughput result of networks



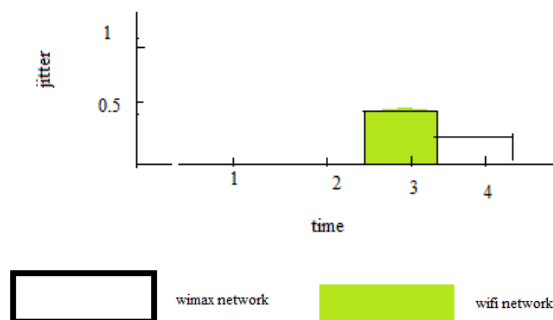
End -2-end delay

End -2-End delay is defined as the time taken for packet reach from the source to destination. The end -2-end dealy of wimax network is low when compared to the wifi network .the following diagram shows the end-2-end delay results.



Jitter

Simulation result of jitter is displayed in following graph comparing to two environments wimax network has the lower jitter value.



From the above three performance metric results of two environments WIMAX network has the better performance than the wifi network

Conclusion

In this paper we compare different networks with the WIMAX network by simulating results in Qualnet simulator. In that WIMAX network shows the efficient Throughput, Reduction of E-2-E delay, and reduction of jitter.

References

- [1]. IEEE 802.16 Working Group. "IEEE Standard for Local and Metropolitan Area Networks, Part 16: Air interface for fixed broadband wireless access systems," *IEEE Std 802* (2004).
- [2]. D. H. Lee, K. Kyamakya and J. P. Umondi, "Fast handover algorithm for IEEE 802.16 e broadband wireless access system," *Wireless pervasive computing, 2006 1st international Symposium on. IEEE*, 2006.
- [3]. D.T. Chen, N. Natarajan, and Y. Sun "On the Simulation, Modeling, and Performance Analysis of an 802.16E Mobile Broadband Wireless Access System", *Proceeding of CCN*, October 24 – 26, 2005,
- [4]. Zaggoulos, G. NixA .and Doufexi, A. " WiMAX System Performance in Highly Mobile Scenarios with Directional Antennas", *Proceedings of IEEE PIMRC 2007*, Athens, Greece, Sept. 3-7, 2007.
- [5]. A. Ezzouhairi, Q. Alejandro and S. Pierre, "Towards cross layer mobility support in metropolitan networks," *Computer Communications , ELSEVIER 33.2* (2010): 202-221.
- [6]. A. S. Rashid, A. A. Hassan, M. Amitava, F. Franciscoand W. K. Daniel, "Wi MAX, LTE, and WiFi interworking," *Journal of Computer Systems, Networks, and Communications*, 2010.

