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Impact of Data Rate for VoIP Quality over Direct Sequence 802.11b

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Abstract

Wireless LAN connects two or more devices using Orthogonal Frequency Division Multiplexing (OFDM) or Direct Sequence Spread Spectrum (DSSS) modulation techniques to establish communication between devices within a limited range. This paper mainly aimed to study wireless local area network WLAN and analyze VoIP over WLAN and explore the evaluation of VoIP over WLAN in term of quality of service using OPNET simulator to analysis and evaluated network.

***Keywords**: WLAN, QoS, Data rate, Direct sequence.*

1. Introduction

A wireless network is any kind of computer network that is connected wirelessly, meaning that the nodes are connected to each other or to the telecommunications network (Which connected them to the internet or backbone wired network) without the need of wires. Wireless networks use the electromagnetic waves (commonly radio waves) for carrying the signals and data between the nodes and it is implemented at the physical layer meant to replace the wires. [1] Some common types of wireless networks are as follows:

- Personal Area Network (PAN)
- Wireless Local Area Network (WLAN)
- Wireless Metropolitan Area Network (WMAN)

2. VoIP Protocol Stack

As its name implies, VoIP utilizes IP as its basic transport method. VoIP utilizes both the Transmission Control Protocol (TCP) and User Data gram Protocol (UDP) over IP.It is important to note that VoIP works with any protocols tack that supports IP .End users of VoIP can add enterprise VoIP systems to their existing infrastructure relatively quickly and easily. The widest VoIP protocols are **SIP Protocol:** As with HTTP, SIP messages can be broken into two major categories, including messages from clients to servers and messages from servers back to clients. And **RTP:** that supports user voice. Each RTP packet contains small sample of the voice conversation. The size of the packet and the size of the voice sample inside the packet will depend on the CODEC used. And **H.323:** is made up of several parts. Each part is responsible for specific tasks, such as call setup and phone registration. [2]

3. Quality of Service

Quality of Service (QoS) is the ability to measure the network’s performance such that it delivers predictable results. Quality of Service helps to differentiate between the type of service required and the type of traffic and is a very important tool for VoIP services. The VoIP, quality means the ability to talk and listen clearly without any unwanted noise. The three major factors that affect the speech quality in VoIP are: delay, Jitter and MOS value. [3]

Delay: It is the amount of time it takes a signal to propagate through a copper wire or a Fibres optic and the Jitter is difference in the expected time of arrival and the actual time of arrival of the packet is called jitter.and the MOS value inNormally a observer gives each sentence a rating as follows: (1) bad; (2) poor; (3) fair; (4) good; (5) excellent by listening to the whole conversation. Many studies and research are found in performance of voice over internet protocol in wlan such as:

Author	Title of study	Type of study	Place of publication	Date of publication
L. Cai, Y. Xiao, X. Shen, L. Cai, and J. W. Mark	VoIP over WLAN: Voice capacity, admission control, QoS, and MAC	paper	Int. J. Commun. Syst., vol. 19, no. 4, pp. 491–508	2006 [4]
M. H. Miraz, S. A. Molvi, M. Ali, M. A. Ganie, and A. H. Hussein	Analysis of QoS of VoIP Traffic through WiFi-UMTS Networks	paper	vol. I, pp. 2–7	2014[5]
N. M. Gambhir	Measurement of Speech Quality in VoIP over Wireless LAN during Handoff,	MSc		2009[6]
A. Mahmood	Performance Evaluation of WLAN for Mutual Interaction between Unicast and Multicast Communication Sessions	MSc	Environments, no	2008[7]

All these conventional studies had evaluated and analysis of the performance of VoIP over Wirelesslan and conduct several of test cases in VoIP by constructing different simulation scenarios under software and concluded that VoWLAN is a promising but very challenging technology that needs more efforts to achieve potential success in the future. Some important open issues for further investigation: voice/data capacity analysis for effective admission control, voice performance analysis in QoS-enhanced 802.11e WLANs, admission control and optimal bandwidth aggregation in WLAN/cellular systems, network security and voice performance trade-off, etc.

4. Simulation

The network model was built and configured using OPNET simulator, and the simulation was run in two scenarios by using direct sequence 802.11b technology by using different data rate. The network model is shown in fig (1):

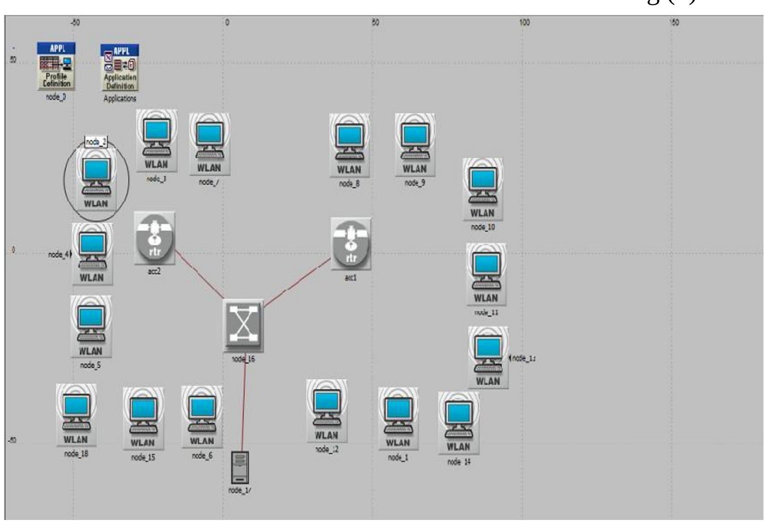

Fig (1): The Simulation Network Model

Table (1): Simulation Environments

Numbers of nodes	16 nodes
Network scale	Office
Specify size	100*100 m2
Technology	802.11b direct sequence
Data rate	(11, 5.5) Mbps
Link model	100BaseT full duplex
Application	Voice over IP call (PCM Quality)
Duration of simulation	120 second

5. Results

After running the simulation we get the flowing results for different scenario as showing below:

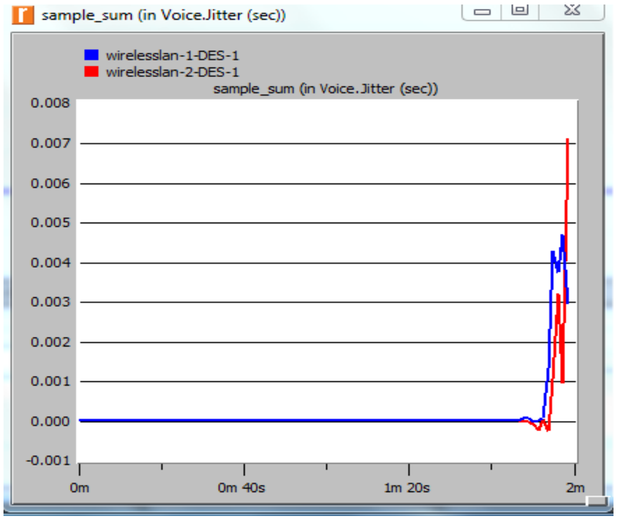

Fig (2): Voice Jitter

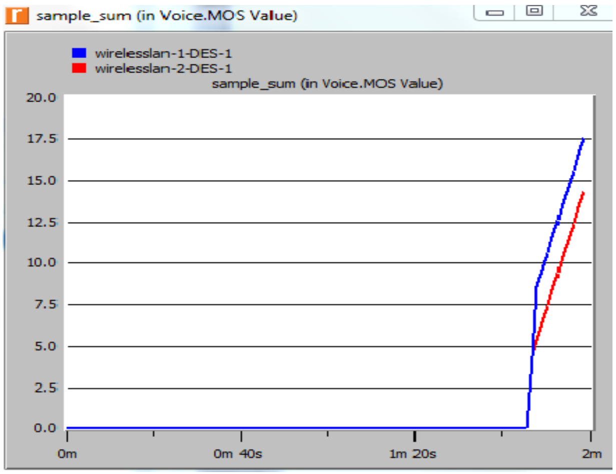

Fig (3): MOS Value

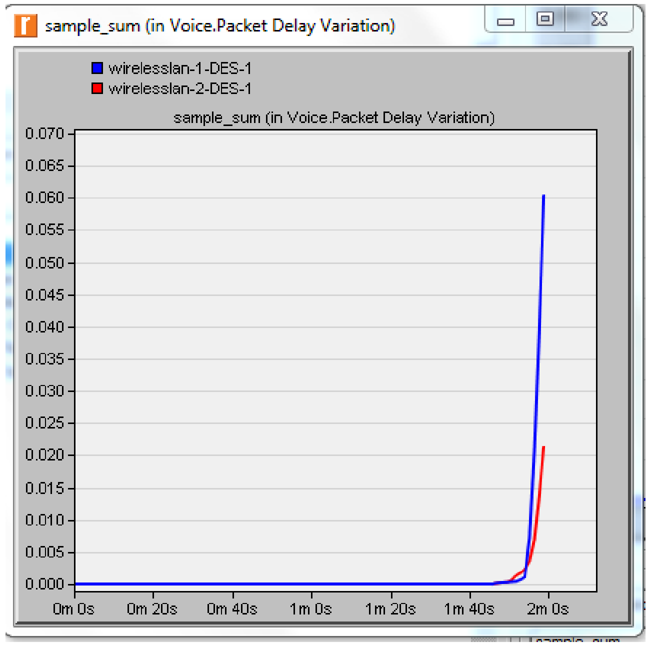

Fig (4): Voice Packet Delay

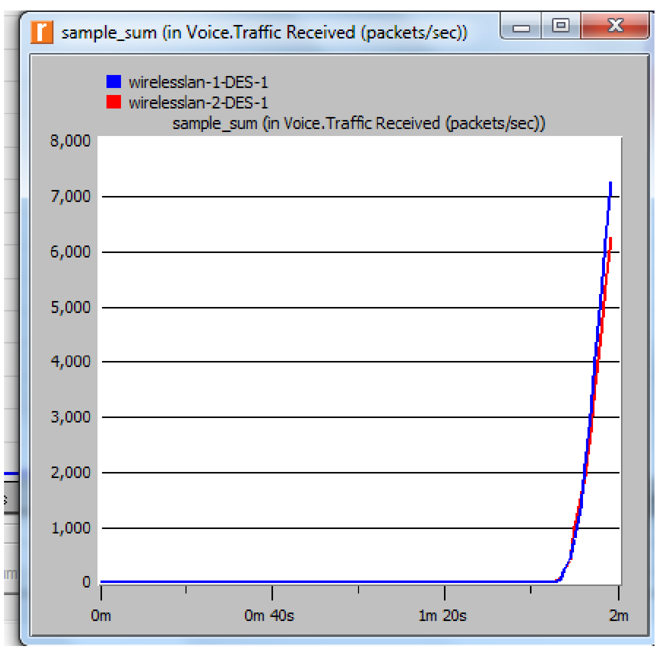

Fig (5): Voice Traffic Received

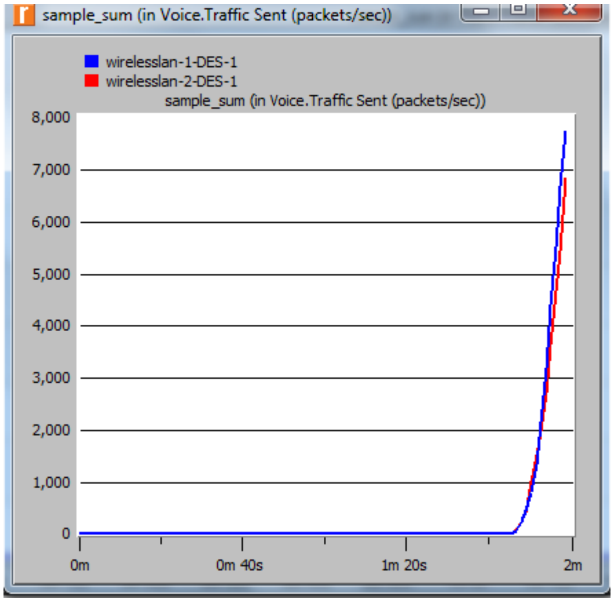

Fig (6): Voice Traffic Sent

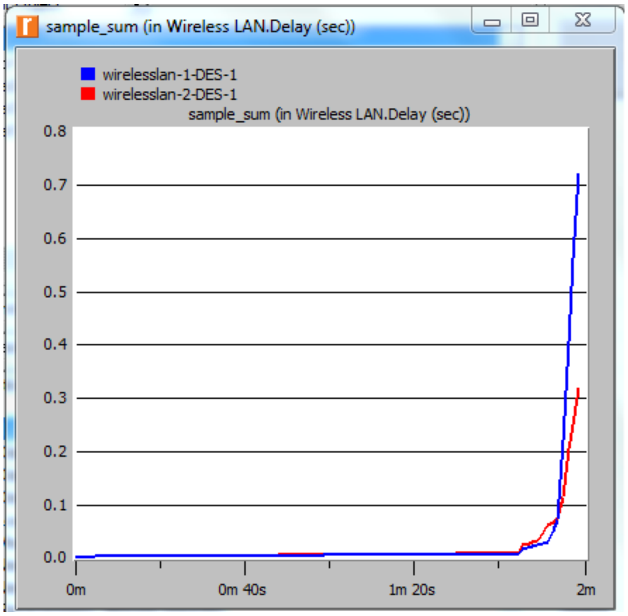

Fig (7): Wireless LAN Delay

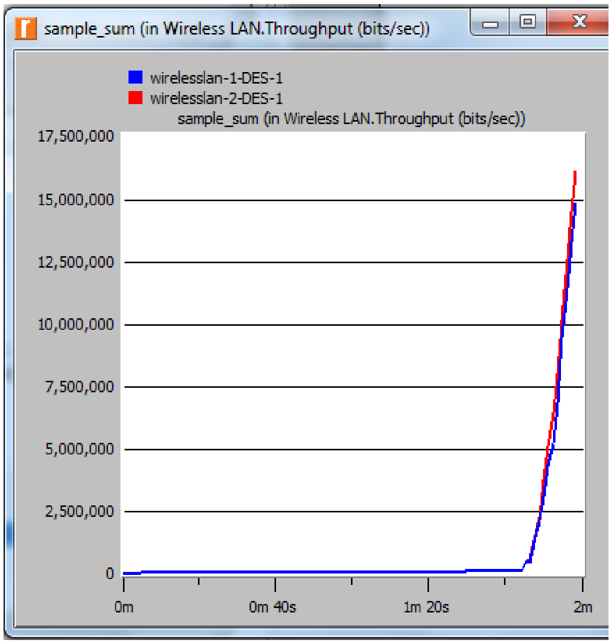

Fig (8): Wireless LAN Throughput

6. Results Discussion

From all previous results, when used data rate11Mpbs and no. of node 16 and technology 802.11b direct sequence in 120 sec and Data rate5.5Mpbs and no of node 16 and technology 802.11b direct sequence in 120 sec.

The result of QoS VS simulation time is:

- If the data rate increases the jitter decreases.
- If the data rate increases the MOS increases.
- If the data rate increases the packet delay increases.
- If the data rate increases the traffic receive increases.
- If the data rate increases the traffic sent increases.
- If the data rate increases the delay increases.
- If the data rate increases the throughput decreases.

7. Conclusion

From the previous scenarios and subsequent of analysis, we conclude that the possible performance quality of VoIP associated with the datarate. If MOS, traffic sent, traffic received and jitter are taken to be the most prioritized QoS factors, we must used high value of datarate over other datarate.

Reference

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[5] M. H. Miraz, S. A. Molvi, M. Ali, M. A. Ganie, and A. H. Hussein, “Analysis of QoS of VoIP Traffic through WiFi-UMTS Networks,” vol. I, pp. 2–7, 2014.

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