Implementation of QoS over WLAN Networks of Model Nodes Using Opnet

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Abstract

Quality of Service (QoS) is the set of techniques to manage network resources. And QoS is an advanced feature that prioritizes internet traffic for applications, online gaming, Ethernet LAN ports, or specified MAC addresses to minimize the impact of busy bandwidth. As increasing demand in the field of wireless communication QoS becomes an important consideration for supporting variety of applications that utilizes network resources. Computer simulation is becoming increasingly popular among computer network researchers for performance modeling and evaluation of computer and telecommunication networks. Here we have presented a simulation study by using technology network WLAN (wireless lan) and IEEE802.11b protocol applied in E-learning classroom scenarios. The simulations, conducted using OPNET modeler 14.5. Various real life setup in the simulation environment. Parameters such that load, throughput and media access delay are analyzed. Our paper has discussed all things we said specially in difference between fixed and mobile nodes and compared between them.

Keywords: *Wireless Local Area Network (WLAN), OPNET MODELER14.5,QoS,Nodes* .

1. Introduction

WLAN stands for Wireless local area network. It is the technology aimed to provide wireless data access over short distances[1]. WLAN market is increasing every day. Due to its convenience, mobility, and high-speed access, WLAN represents an important future for Internet access. Growing use of multimedia applications in today life and time bounded services motivated the WLAN in the market[5] .Wireless technologies have revolutionized the way people think about networks, by offering users freedom from the constraints of physical wires. Wireless access points are now commonplace on many areas such as: homes, airports, university campuses . One of the popular technologies in the wireless LAN market is the Institute of Electrical and Electronics Engineers IEEE 802.11b standard. This popular "Wi-Fi" (Wireless Fidelity) technology provides low-cost

wireless Internet capability for end users, with up to 11 Mbps data transmission rate at the physical layer. The IEEE 802.11b standard defines the channel access protocol used at the MAC layer, namely Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)[6].

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Wireless Internet and IEEE 802.11b standard expands the original IEEE 802.11 with Direct Sequence Spread Spectrum (DSSS) to operate up to 11 Mbps data rate in the 2.4-GHz unlicensed spectrum using complementary code keying (CCK) modulation technique. With the recent adoption of new standards for high-rate wireless LANs, mobile users can realize levels of performance, throughput, and availability comparable to those of traditional wired Ethernet[4].

As a result, WLANs are on the verge of becoming a mainstream connectivity solution for a broad range of business customers. This research describes the new IEEE 802.11b standard for wireless transmission at rates up to 11 Mbps, which promises to open new markets for WLANs. It describes 802.11 and 802.11b technology and discusses the key considerations for selecting a reliable, high-performance wireless LAN[4].

1.1 PRELIMINARIES

WLAN Components

Basic components of a WLAN are access points (APs) and Network Interface Cards (NIC)/client adapters and these discussed as follows :

Access point (AP) is the wireless equivalent of a LAN hub. It is connected with the wired backbone through a standard Ethernet cable. IEEE 802.11b defines two pieces of equipment, a wireless station, which is usually a PC or a Laptop with a wireless network interface card (NIC), and an Access Point (AP),which acts as a bridge between the wireless stations and Distribution System (DS) or wired networks. There are two operation modes in IEEE 802.11b, Infrastructure Mode and Ad Hoc Mode[7] in Figure.1 .In our model we used Infrastructure Mode Infrastructure: Mode consists of at least one Access Point connected to the Distribution System[3].

Basis Service Set (BSS) An Access Point provides a local bridge function for the BSS. All wireless stations communicate with the Access Point and no longer communicate directly. All frames are relayed between wireless stations by the Access Point.

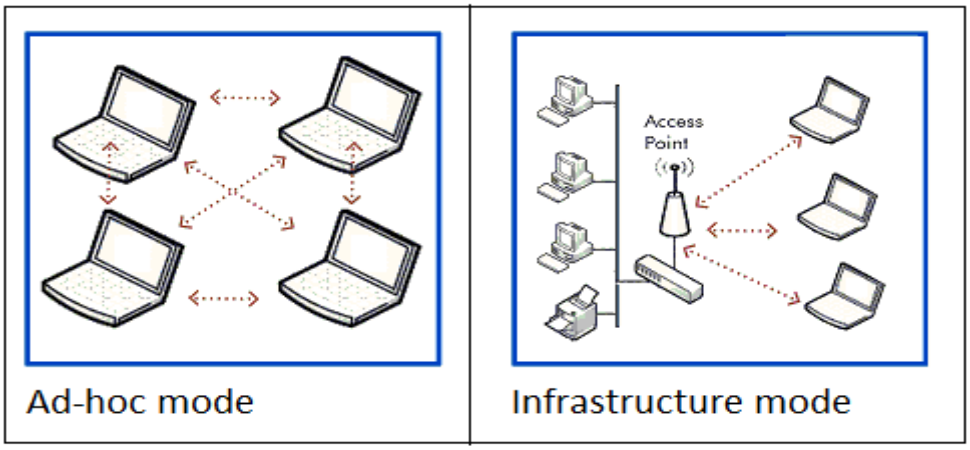

Figure1. Two Basic Wireless Modes

2. RELATED WORK

In this paper we are viewing some research works were done on our subject :

H.S.Mewara, Mukesh Kumar Saini and Rakesh Kumar[3] analyzed the throughput and Delay performance of IEEE 802.11b Wireless Local Area Network (WLAN) with one access point. OPNET IT Guru Simulator (Academic edition) was used to simulate the entire network. In this paper they considered the effects of varying the data-rate were observed on the throughput and Delay performance metric. Some points are to be noted from the results of this simulation:

(1) When the data-rate in a wireless network is increased, the Delay decreases; and packets are delivered more accurately, hence less requirement for retransmission.

(2) When the data-rate in a wireless network is increased, the throughput increases; and packets are delivered more accurately, hence less requirement for retransmission.

Also, Navdeep Singh Chauhan, , Loveljeet Kaur SLIET,Longowa[1] presented paper of implementation of QoS of Different Multimedia Applications in WLAN that used twenty fixed nodes and a single WLAN server to make a perfect network model.

All nodes communicate with each other through WLAN sever. The simulation experiments are carried out using OPNET (version 14.0) on windows platform. The results show that the real time application like (video conferencing, video streaming) the QoS parameters such as Network Load, throughput are increased. Over all they see that the high priority channel benefited, while low priority channel suffered. They can also see that when they use high resolution video in the case of video conferencing and high quality voice in the case of VOIP the QoS parameters are also increase.

Then we have presented previous paper [5]A Performance Evaluation of E-Learning Model over Wireless Network Using Opnet, the paper focus to implemented of QoS of Different Multimedia Applications in WLAN . We have putted the number of fixed nodes 30 and we used 3 Applications : Web browsing , Video Conferencing and voice. Then they used all this applications in simulation as a serial order . From the result of simulation WLAN 802.11b baseline network model is good to support applications with number of clients during 12 minutes.

3. Proposed MODEL :

Here the network assumption by simulation, using technology WLAN network and IEEE802.11b protocol applied in E-learning classroom then details of our model introduced by two Scenario, finally we will be analyzed.

3.1 Network Model /Baseline Scenario:

The IEEE 802.11 standard defines a set of wireless LAN protocols that deliver services similar to those found in wired Ethernet LAN environments. In this paper we modeled the network, and consists of a WLAN workstation fixed node and mobile nodes , a wireless Access Point (AP), an Ethernet-based E-learning Web server, and an Ethernet Switch. The Web server is located on a 100 Mbps Ethernet LAN segment. The nodes client accesses content from the E-learning and Web server via the AP1, using the IEEE 802.11b protocol and the type of Modulation Method, a DSSS. We can choose the access mechanism to the center Medium Access Mechanism.

4. Simulation Scenario:

4.1 Scenario 1 : WLAN QoS for Fixe Nodes

This scenario has a single fixed Access Point , thirty clients fixed nodes were chosen as the WLAN configuration for the model. All fixed nodes are the same distance from the AP in Fig 2 . The WLAN 802.11b baseline network model is configured to generate three types of application traffic: web browsing, Voice over IP Call (PCM Quality) and video conference. However, all the applications defined in OPNET Modeler are enabled for future use. Table1. shows the nodes and the applications commonly used, also shows the profile configuration, which defines how the applications are run at the OPNET network level. Every profile contains many number of applications, configured as shown in Table.1 , which runs throughout the simulation.

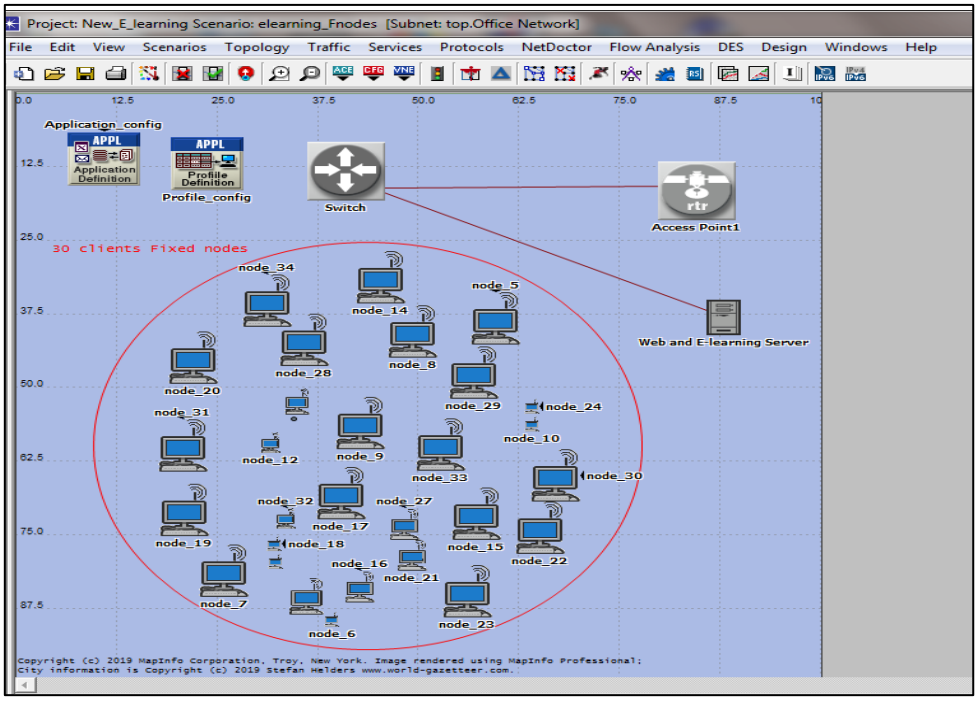

Figure2. WLAN QoS , 30 Clients Fixed .

4.2 Scenario 2: WLAN QoS for Mobile Nodes

In this scenario we changed thirty fixed nodes to mobile nodes were chosen as the WLAN configuration for the model instead the fixed. Trajectory is defined from OPNET application for 10 Km/ hour for mobile network .The mobile unit can moved around while it is communicating. When it goes out of range of one base station, it disconnects with base station .

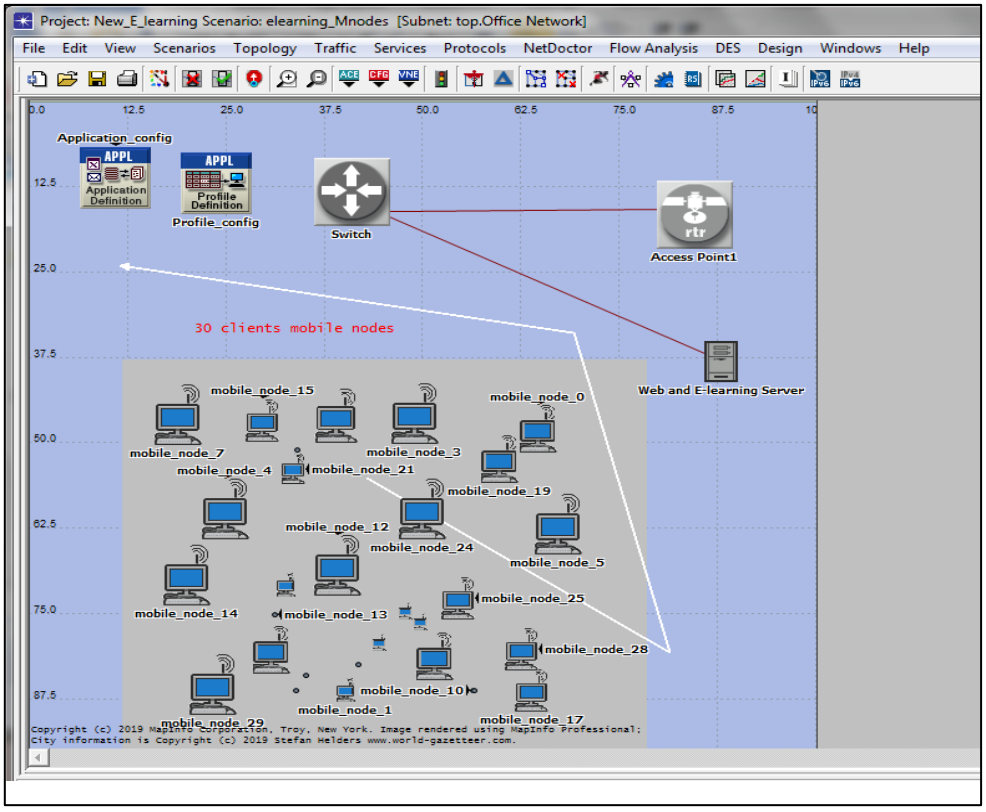

Figure3. WLAN QoS , 30 Clients Mobile

Table 1 User profiles and applications

Profile /nodes	Applications		
	Web browsing	Video Conferencing	Voice
30 Fixed nodes	Heavy HTTP1/1	High resolution video	Voice (PCM)
30 Mobile nodes	Heavy HTTP1/1	High resolution video	Voice (PCM)

5. Testing and Result

a. Load :

Network load define the total load on WLAN. Different applications have different effect on network load. Network load also depends upon the type and size of data. For example, for real time applications load will be high as compare to other type of data.

The overall load of WLAN data is displayed in fixed nodes showing an average value 14358.97Kbps on the 10 minute mark in Fig .4 while in mobile nodes showing an average

value of 11184.908875Kbps in the same Fig .4 .We can saw that the network load of fixed nodes is higher than the mobile nodes.

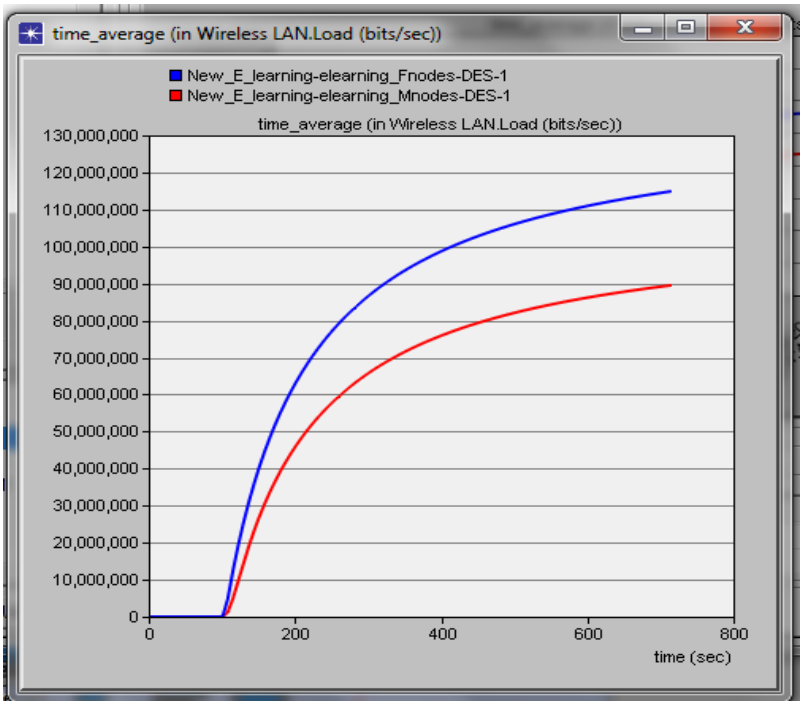

Figure 4 Total load of WLAN

b. Throughput :

Throughput refers to how much data can be transferred from one location to another in a given amount of time.

The overall throughput of the WLAN in fixed and mobile nodes are shown in Fig 5.Throughput of fixed noes is greater than he mobile nodes

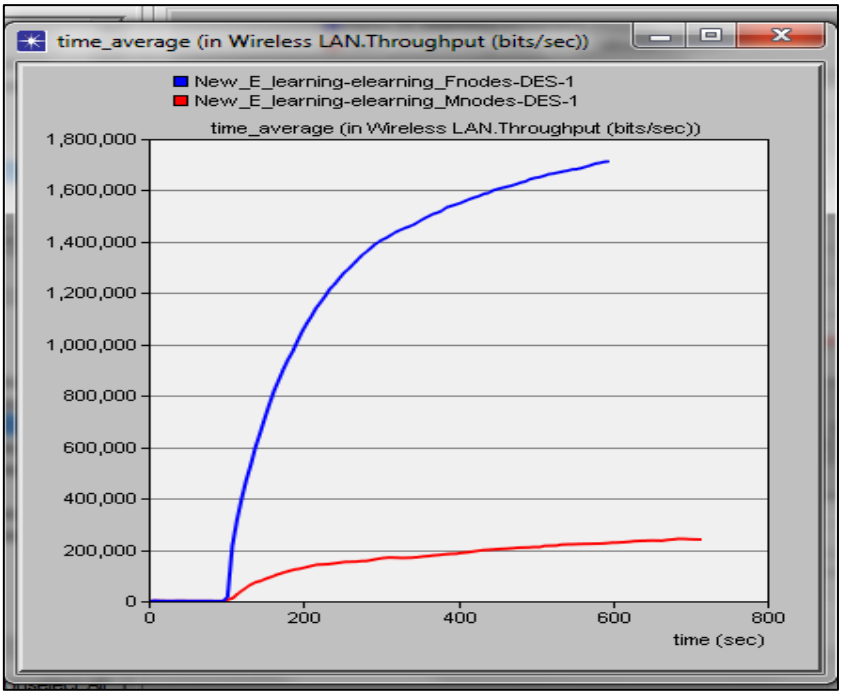

Figure 5. The overall throughput of the WLAN

c. Media Access Delay

In computer networks, media access delay is the amount of time it takes for the head of the signal to access a medium.

The delay in mobile nodes is slower 1s approximately in the final simulation than fixed nodes .Where in fixed nodes delay has maximum at 5.2s.

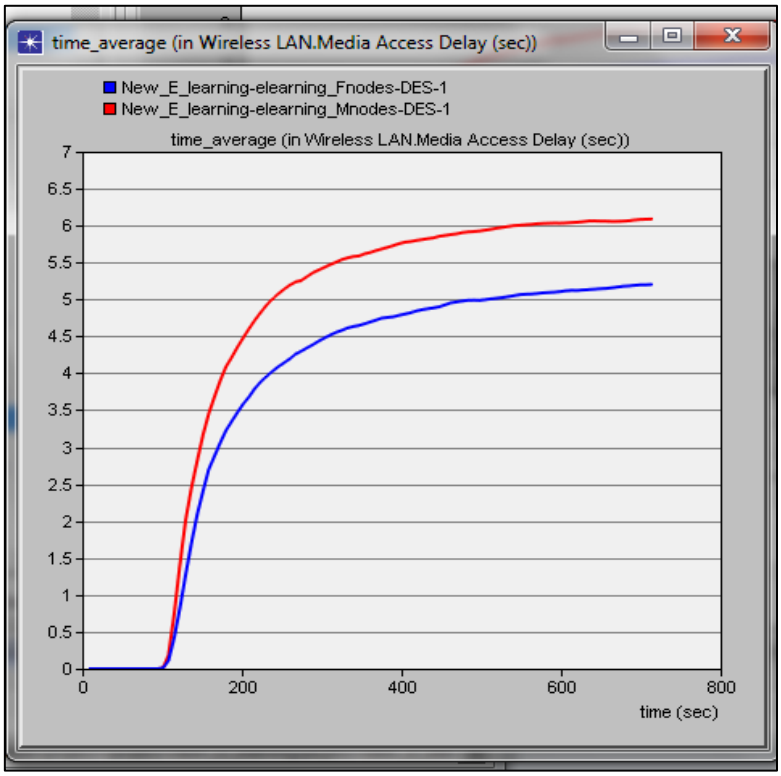

Figure 6.) Media Access Delay of the WLAN

6. Comparison With Related Works

In order to compare our work with other works focusing on the same subject, We have made some improvements like:

Our paper focus to implemented of QoS of Different Multimedia Applications in WLAN of Model Nodes , the previous study used 30 fixed nodes and 3 Applications .In our paper we have added 30 mobile nodes.

Table 2. Users applications

Web browsing	Video Conferencing	Voice
Heavy HTTP1/1	Heavy	(PCM)

Table 3. Comparison Factors

Factor	Fixed Nodes	Mobile Nodes
No.Clients	30	30
Applications	3	3
Time	12	12

In our paper the performance of media access delay, load and Throughput in both fixed and mobile .Then we have chosen measurements application and profile illustrated in Table 2.

From the result of simulation the WLAN 802.11b baseline network model is good to support applications with number of clients during 12 minutes .

Also the result of simulation WLAN 802.11b baseline network model is good to support applications in two networking approach fixed and mobile but some differences are found in two the states.

7. Conclusion & Future Work

7.1 Conclusion

We presented a simulation study by using technology WLAN network and IEEE802.11b protocol From the result of simulation WLAN 802.11b baseline network model is good to support applications with number of clients during 12 minutes .

Also from the results show that the real time application like (video conferencing, voice) the QoS parameters such as Network Load, throughput , media access delay are increased.

The overall load and throughput of the WLAN in fixed are greater than mobile nodes also media access delay in mobile nodes slower 1s approximately in the final simulation than fixed nodes .

In fixed nodes there is no mobility in the system. This means our results will not be impacted by mobility and phenomenon such as the hidden node problem.

Also the mobile unit can move while it is communicating. When it goes out of range of one base station, it disconnects with it .

7.2Future Work

After the completion the our paper Using Opnet that God willing I aspire to a wider area of research in the following:

- In Yemen we will attempt to create web site for E-learning project which is a different educational experiment , which improves the way of learning to a modern technological learning by using model MOOCs depended on model which we were

created by Opnet.

- Analysis of QoS Over Internet Networks between countries

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