Performance Analysis of WLAN Criterions for Video Conferencing Applications

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Abstract

A number of traffic classification studies have been accepted out on wireless LANs, which indicate that the wireless settings pose major challenges, especially for high bandwidth and delay sensitive applications. This paper aims to estimate a number of Quality of Service (QoS) parameters correlated to video conferencing over three major WLAN Standards 802.11a, 802.11b and 802.11g. To study the traffic characterization conduct of these WLAN standards, we have simulated the environment for each of these standards and accomplished experiments. Outcomes are verified through the delivery of prosperousH.261 video traffic import in OPNET-14 Network simulator. We found that a trade-off exists among the selected data rate, physical appearances and the frequency spectrum (number of channels) for every standard. The traffic of video conferencing is characterized over each standard in terms of delay routine, traffic performance and load and throughput performance. The results show that quality of video traffic is a function of the frequency band, physical distinguishing, maximum data rate and buffer sizes of WLAN standards.

Keywords- *WLAN standards, QoS support, video conferencing, OPNET-14.*

I. INTRODUCTION

The field of wireless local area networks (WLANs) is being extensively studied and used in several emerging research domains such as mobile and inescapable computing, where WLANs provide high-speed wireless connection and sustenance accessing information from anywhere and anytime. WLANs support a wide variety of applications, which may include simple applications such as web browsing, file transferring, etc and the other ones, for instance, real-time multimedia applications. The latter necessitates better quality of service than the former. A detailed survey of quality of service in WLANs can be found. While unassuming applications may well be maintained by WLANs, the applications requiring better quality of services may agonise due to reasons that the wireless channels are error prone, band-limited, etc. IEEE 802.11[3-8] is a vital standard for wireless LAN, which adopts the standard 802 logical link control (LLC) protocol that is further separated into two sub layers: physical layer (PHY) and medium access control (MAC) layer. This configuration offers optimized functionality for wireless communication. Initially 802.11 had two physical layers,

- Direct Sequence Spread Spectrum (DSSS)
- Frequency Hopping Spread Spectrum (FHSS)

And later on the physical layer was characterized into three types with dissimilar physical characteristics and frequency spectrum. The physical characteristic of 802.11a and 802.11g are identical – both are constructed on OFDM and support data rate of 54 Mb/s. Though they differ in operating frequency spectrum– 802.11a operates on 5 GHz band, while 802.11g on 2.4 GHz. 802.11b is based on DSSS and operates at 2.4 GHz band with transmission rate from 1 to 11 Mb/s. 802.11a has noteworthy advantage due to the wide range spectrum of 5 GHz, having more number of independent channels. Both 802.11b and 802.11g are companionable with each other as both operates on 2.4GHz spectrum, but this may cause degradation in system performance as 2.4 GHz is a small band spectrum with a lesser number of self-governing channels.

The central objective of the work presented in this paper is to learning the recital of three WLAN standards, 802.11a, 802.11b and 802.11g, especially when supportive a videoconferencing application, using these parameters:

(i) used frequency spectrum and presented number of orthogonal channels for each WLAN standards,
(ii) used modulation performance ofeach standard,
(iii) particular buffer size for application,
(iv) Load of control and data channels ineach standard.

We have used OPNET-14 simulator to simulate 802.11a/b/g-basedWLANs for our study.

II. RELATED WORK

There exists a large body of examination on Multimedia Traffic characterization either on wired or wireless LANs. In video traffic has been investigated on Ethernet LANS over two different data rates: 10 Mbps and 100 Mbps converging on characterization of quality of video in terms of glitches. The research efforts focus on 802.11b network, where in authors have categorised UDP traffic over 802.11bWLANs using parameters such as throughput, average delay, frame error rate, IP loss rate, etc. In contrast, in [13], the 802.11b has been investigated for its capabilities for voice traffic with the focus on minimizing Mean Opinion Score (MOS) necessities. The authors have developed a simple packet delay jitter investigative model for IEEE 802.11DCF, which calculates average packet delay and packet delay variability. The authors have extended their work carried out in which the proposed model is used to appraise the recital of WLANs, especially for applications involving both voice and data. The parameters being used for presentation evaluation include throughput, jitter, and loss rate prospect.

In, an analytical model has been industrialised for IEEE 802.11b Distributed Coordination Function (DCF), which calculates various parameters such as an average voice packet, voice packet delay variation (jitter) and packet drop prospect for voice packets. Additionally, authors have studied the impact of data transmission on voice capacity. Work carried out in focuses on addressing the issues of real-time video streaming over WLANs, especially over IEEE 802.11b. Their solution is based on grouping of forward error control (FEC) coding with the ARQ protocol. The authors have investigated IEEE 802.11e standard for its competence for QoS support. This is done by appraising both the Enhanced Distributed Channel Access (EDCA) and the Polling-based Channel Access modes of this standard for multiple traffics such as real-timeaudio and video traffic. Correspondingly also focuses on appraisal of WLAN standard's capability for QoS funding and involves evaluation of two MAC layer protocols:

- DCF(Distributed Coordination Function)
- EDCF (Enhanced Distributed Coordination Function).

Their appraisal suggests that EDCF is better in providing QoS for numerous services environment as EDCF has a capability to distinguish and prioritize services. The authors have evaluated the performance of 802.11 WLAN in terms of throughput, using four types of applications, http, remote login, video conferencing and voice over IP. Estimation of throughputs done in occurrence of high priority traffic and low priority traffic that is http, remote login traffic. It can be famous that research efforts discoursed above provides performance evaluation of a single WLAN standard. In contrast to these, our study offers performance investigation of three WLAN standards: 802.11a /g /b for video conferencing application.

III. EXPERIMENTAL SETUP

In order to study the presentation of three Wireless LAN standards for video conferencing application, we have replicated the network setup using OPNET-14 simulator and showed various tests on it. A basic organisation mode network has been used for experimental setup, in which four Basic Service Sets (BSSs): BBS 0, BSS 1, BSS 2 and BSS 3 have been set, where each BSS is working as autonomous wireless LAN. Multiple numbers of wireless clients arerunning under BSS 0 and BSS 1, a wireless submission server is running on BSS 2 and BSS 3 is organised as a backbone network for involving other three LANs. These three LANs, BSS 0, BSS 1 and BSS 2 are associated to each other with three routers. Both router has two WLAN interfaces; one of them serves as an access point for BSS 0, BSS 1and BSS 2, while the other boundary of three routers make up the WLAN-backbone (BSS 3).The first interface, IF0 of BSS 0, BSS 1 and BSS 2 is constructed as an access point with BSSID being set to 0, 1 and 2 disjointedly. Whereas the second interface, IF1 of three BSSs have been neutralised for access point functionality and all of IF1s have been set with the same ID, which is 3. These three IF1s make up a Wireless backbone (BSS 3),as mentioned before.

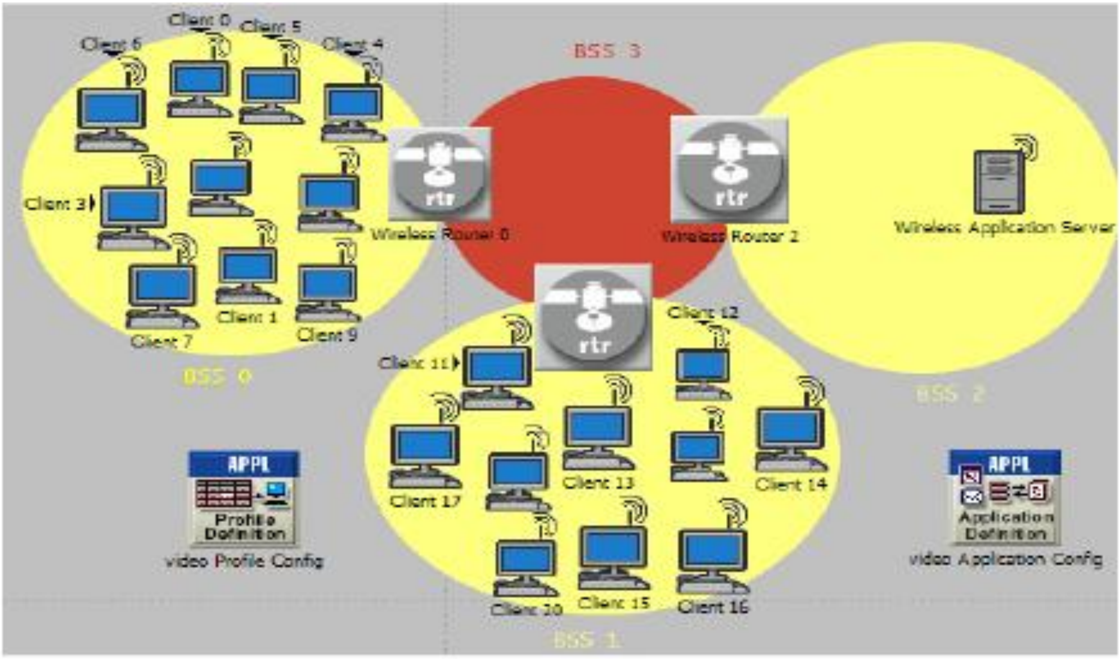

Figure 1: WLAN Setup

Attribute Setup: The attributes of each standard assumed according to the requirements.

IV. RESULTS AND DISCUSSION

In this section, we current the results of various tests we have directed to analyze the performance of three wireless standards, 802.11 a, 802.11 b and 802.11g. Tests contain Delay Performance, Traffic Performance and Load and Throughput Performance.

A. Delay Performance

Delay is an important metric to characterize the QoS of any network, particularly for real time Multimedia application. The delay is definite as the time taken by the system for data to reach the endpoint after it leaves the source. The delay for any network can be unrushed at three layers, end-to-end delay, wireless LAN delay and MAC (media access control) delay. Wireless LAN delay depends on used frequency band and media access delay on media access practise and physical characteristic of the standard, while end-to-end delay embraces both wireless LAN delay and MAC delay. The ensuing figures show the results of end-to-end delay test, wireless delay test and MAC delay test.

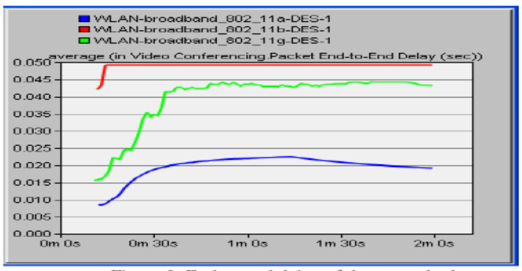

Figure 2: End-to-end Delay of Three Standards

B. Traffic Performance

One of the constraints that can influence on overall presentation of the Wireless Local Area Networks (WLANs) is traffic analysis. Traffic analysis comprises traffic sent, traffic dropped and traffic received. Traffic sent defines the capability of the system to spread amount of data from the source point, while traffic received determines the amount of the data received at the destination. The traffic drop in submissions such as video conferencing is often triggered by the buffer overflow and the amount of data plunged can be resolute from the amount of data transmitted and received.

C. Load & Throughput Performance

Another limitation that influences the overall recital of the wireless standards is load &throughput. The load & throughput test is troubled with the receipt of the payload data deprived of considering overhead of network against load. We have directed three tests to analyse the load & throughput routine of each of three wireless standards.

V. CONCLUSION

Foremost motivation behind the work accessible in this paper was to explore the performance ofthree main WLAN standards, 802.11a, 802.11b and 802.11g, especially for the applications which have high bandwidth necessities such as video conferencing application. Therefore, we performed various tests using OPNET-14 simulator. Recital testsconducted were Delay Performance, Traffic Performance and Load & Throughput Performance. In Delay Performance test, we experimental the results for three cases: End-To-

End Delay, Wireless LAN Delay and MAC Delay, which indicate that 802.11a has minimum delay. Traffic performance test encompassed three cases: Traffic sent, Traffic Received and Data Dropped. The results of this test displayed that the 80211a has minimum data drop, hence improved data receipt.

Load & Throughput test includes three cases: WLAN load, Throughput and Retransmission Attempts. We detected that under heavy load of LAN traffic, 802.11a has maximum throughput with minimum retransmission attempts, while 802.11g achieves poorly under traffic load and have minimum throughput. The results accessible clearly indicate that the performance of WLAN varies depending on the choice of parameters such as used frequency band, physical characteristic and maximum data rate of WLAN standards. We detected that OFDM is an efficient while working on 5 GHz band whereas DSSS performs better on 2.4 GHz band. Since the results of all three tests, the 802.11a falls out to be a better choice than two other morals, 802.11b and 802.11g, exclusively for the applications needing high bandwidth for smooth operations.

REFERENCES

[1] H. Zhu, M. Li, I. Chlamtac, B. Prabhakaran, " A survey of quality of service in IEEE 802.11networks", IEEE Wireless Communications, 2004.

[2] M. Chen and A. Zakhor, "Rate Control for Streaming Video over Wireless", IEEE ConferenceProceedings, INFOCOM, 2004.

[3] IEEE 802.11 WG, Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer(PHY) specification, Standard, IEEE, August 1999.

[4] IEEE 802.11b WG, Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer(PHY) specification: High-speed Physical Layer Extension in the 2.4 GHz Band, IEEE,September 1999.

[5] IEEE 802.11a WG, Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer(PHY) specification: High-speed Physical Layer in the 5GHz Band, September 1999.

[6] IEEE 802.11e WG, Draft Supplement to Part 11: Wireless Medium Access Control (MAC) andphysical layer (PHY) specifications: Medium Access Control (MAC) Enhancements for Qualityof Service (QoS), IEEE Standard 802.11e/D3.3.2 , November 2002.

[7] IEEE 802.11e/D11.0, Draft Supplement to Part 11: Wireless Medium Access Control (MAC)and physical layer (PHY) specifications: Medium Access Control (MAC) Enhancements forQuality of Service (QoS), October 2004.

[8] IEEE Standard 802.11g/D1.1-2001, Part11: Wireless LAN Medium Access Control (MAC) andPhysical Layer (PHY) specifications: Further Higher-Speed Physical Layer Extension in the 2.4GHz Band.

[9] OPNET Technologies, http://www.opnet.com/solutions/network_rd/modeler.html

[10] Mohammad M. Siddique, A. Konsgen, "WLAN Lab Opnet Tutorial", University Bermen Press,2007.