Wireless LAN System With Load Balancer Analysis For FTP Protocol

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Abstract:

Over the years, Internet connectivity based on the concept of Wireless Local Area Network (WLAN) has turn out to beone of the most reliable and promising technology. WLANs offers open link to the customers so as to provide smooth and feasible access to the communication system and associated applications. A wireless system provides flexible installation in comparison with wired networks.
In this paper, a novel WLAN system is analyzed for diverse data rates for FTP protocol in the presence of load balancer and without the use of it. Two scenarios are created with same physical and MAC layer parameters. The WLAN model is evaluated to measure the performance for campus environment. The WLANs parameters such as response time, wireless media access delay and throughput are affected by the number of user per application with and without load balancing.

Key words: WLANS, FTP, Load Balancer, QoS, Response Time

I. Introduction

With the technological transformations occurring at a fast pace, the requirement of transmission capacity and communication rate is increasing. This has led to changes in the needs of the end customers and their requirements. The newer application areas have varied needs from the system protocol. Global interconnection of clients through internet having higher bandwidth has become a basic requirement for achieving their goals. Over the years, Internet connectivity based on the concept of Wireless Local Area Network (WLAN) has turn out to beone of the most reliable and promising technology. WLANs offers open link to the customers so as to provide smooth and feasible access to the communication system and associated applications. A wireless system provides flexible installation in comparison with wired networks. Also, the installation cost of the wireless systems is on a higher side and offers long transmission delays. But with the introduction of the WLANs solutions, the transmission capacity has improved leading to higher transmission rate with lower delays decreasing the cost of the systems.

WLAN interconnects communicating devices like desktop machines, laptops, personal digital assistants (PDAs), smart-phones without a physical connection. The WLAN technology has transformed the way users are accessing internet on their communicable equipments. The elimination of a physical network between users offers a effortless connectivity to the network services. Orthogonal frequency division multiplexing (OFDM) and spread spectrum concepts are utilized in WLANs to communicate through radio waves within a specified region, so as customers can access network while moving within the limited area.

WLANs is required to ensure fulfillment of diverse prerequisites of any connecting system that includes higher bandwidth, lower transmission delays, complete connectivity amongst diverse devices and ability to broadcast signals among others. Furthermore, some specific requirements of wireless networks are increased throughput, connectivity to multiple stations across diverse cells, lower battery usage, interconnection with wired LANs and other networks like wide area networks (WANs), improved data security, dynamic configuration and minimum requirements of license among others.

Wireless systems carry out various tasks so that information signals can be transmitted successfully from source station to destination node. For achieving this, diverse functions are carried out by WLANs that includes offering a transmission channel for transfer of data signals, medium access control (MAC) mechanism so that various devices can effectively utilize the shared channel, routing and error control mechanism are implemented.
There are wide range of products conform to WLANs standards are available in the market. Diverse standards includes IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, or IEEE 802.11n are employed for unique wireless applications. Additionally, Bluetooth also provides wireless access for short range of communication.

The main benefit of employing WLAN in comparison with the wired LAN is ease of installation and providing mobile access to end clients. The basic constituents of WLAN system are customer adaptors, network interface cards known as NIC and access points (APs). Access

point functions similar to a hub and provides connection to backbone network through a Ethernet wire. An antenna is utilized to communicate with various wireless nodes within the defined frequency range. From the interoperability point of view APs adheres to IEEE 802.11 standards. Further, authenticity of the clients and their availability is ensured by the access point. Peer to Peer mode or Infrastructure mode is used to connect client adaptors with the communicating devices through APs. The NIC examines the existing frequency range for connecting an AP in wireless mode. It accompanies a product driver that combines it to the operating system (OS) of the wireless node.

Medium access control (MAC) mechanism is used by the stations to access the shared infrastructure in the wireless networks. The main purpose of the MAC protocol is to characterize various regulations so that all participating nodes in the network have equitable access to transfer data signals. Numerous MAC mechanisms were defined for the WLANs to have a normalized access in the network. MAC ensures different nodes to utilize a common channel through carrier sense multiple access/ collision avoidance (CSMA/CD) mechanism so that cluster of nodes can transfer within the same spectrum. It ensures reliable transportation of information signals over a wireless communication channel.

Wireless LAN employs diverse MAC protocols for its IEEE standards. Distributed coordination function (DCF) is the fundamental mechanism used for IEEE 802.11 b standard that ensure fair access of the shared medium through the CSMA/CD protocol and random back-off time mechanism. Data traffic signals utilizes positive acknowledgement signals for confirmation of the successful receipt of the data, in case acknowledgement frame is not received by the sender within the specified time limit then a retransmission of the data frame is ensure through stop-and-wait automatic repeat request protocol. Both physical and virtual method can be used for sensing the medium. Carrier sense of the channel is accomplished by appropriating reservation data reporting the approaching utilization of the medium; it is cultivated by the use of Request To Send (RTS) and Clear To Send (CTS) packets. Furthermore, the different available spaces in the transmitted packets are utilized to separate between various sorts of transmissions.

Another MAC based mechanism employed by WLANs is Point coordination function (PCF). It is polling based procedure for accessing the channel in which base station works as point coordinator (PC). In PCF available time slots are categorized as super-frames for IEEE 802.11 WLAN standards. Both PCF and DCF mechanism are utilized in the super-frames, for a contention free time DCF is used and for contention based frame PCF can be utilized. The contention free sub period begins through the use a beacon special frame transmitted by the base node. The length of the contention free period might be decreased as the beacon frame is transmitted using a DCF mechanism and the base node has to compete for the availability of the shared channel.The base station maintains a list of mobile nodes that have mentioned to be surveyed to send information. In the contention free sub period, base node transmits the poll packets to the participating nodes when they are obvious to get to the medium. When the poll frame is received by the mobile node, it transmits a information frame that has been lined up for communication. To guarantee that no DCF nodes can during the process, the inter-frame space (IFS) between PCF information packets is more limited than the typical IFS of DCF and is known as PCF Interframe Space (PIFS). To avoid starvation of nodes that are not permitted to transmit during the contention free period, there must consistently be space for no less than one greatest length packet to be sent during the contention time frame.

Enhanced Distributed Coordination Function (EDCF) is another variant of DCF for contention resolution of the shared medium. This mechanism is proposed to give prioritized quality of service (QoS) through an enhanced DCF. The mechanism provides access to the unguided channel through eight diverse user priorities (UPs) for stations. Prior to the frame coming into the MAC layer, a station priority number is allocated to every information frame received from the upper layers. Four diverse first-in first-out (FIFO) methods are outlined by the EDCF to give continuous support for the transfer of data signals with UPs.

Thus efficient MAC mechanism plays a pivotal role in realization of the shared single unguided medium so as stations communicate through a shared radio transmission medium. The MAC protocol is expected to offer a productive utilization of the accessible transmission capacity while fulfilling the Quality of Service (QoS) necessities for both real time services and information carrying applications. Differentiated services (DS) are a bare minimum for improving QoS of communicating applications. DS ensures equitable distribution of resources for diverse categories of data traffic. Diverse implementations are defined to enhance QoS. The main objective of this paper is to provide a comparative examination based on diverse performance measuring metrics in the communication unguided and guided networks.Two application layer protocols Hyper text transfer protocol (HTTP) and File transfer protocol (FTP) and their transactions to achieve a higher throughput in a wireless system is investigated. Also, the effect of access delay and page/object response time is studied.

The rest of the research paper is arranged as follows; the simulation scenariosare presented in next section. The results obtained on various system parameters are explained in section IV of the paper and in the last segment conclusions and future roadmap are provided.

II. System Model

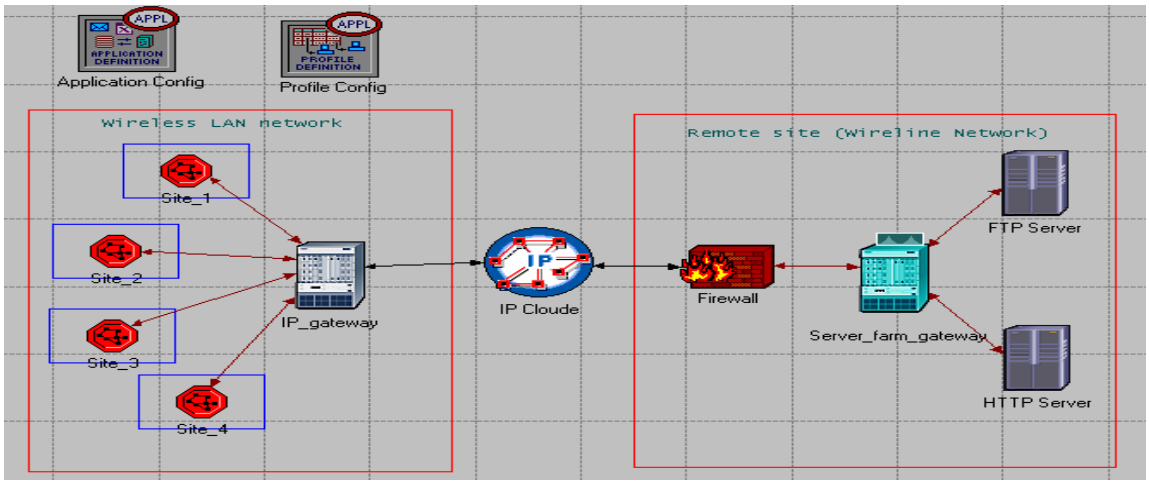


Fig. 1. System Simulation Model

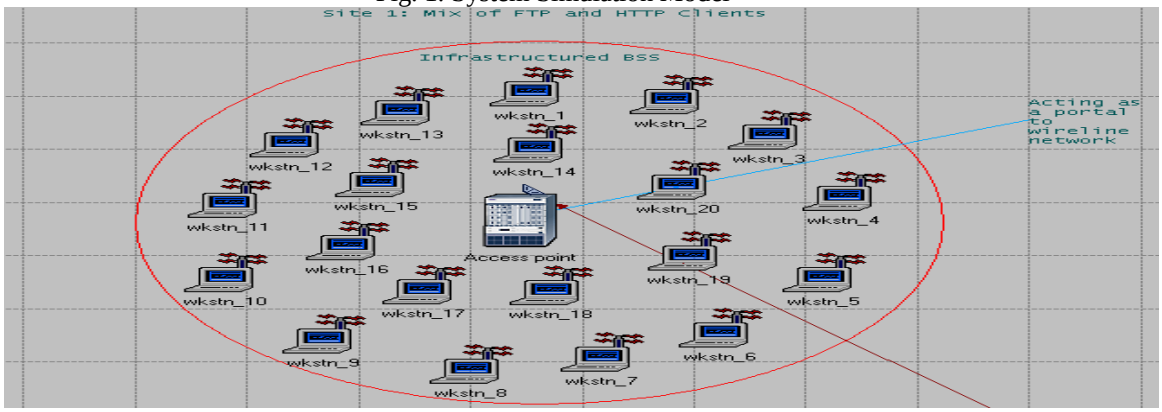


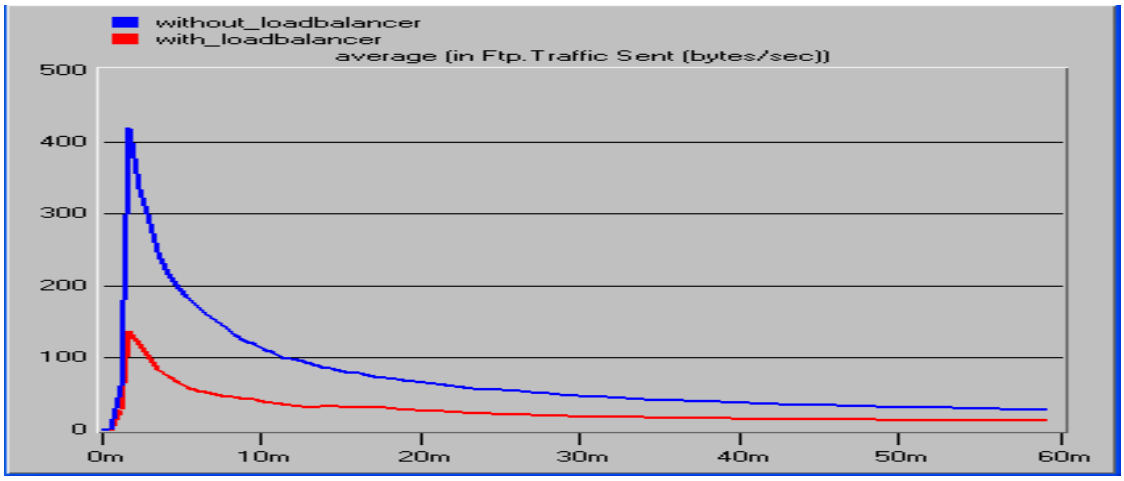
Fig. 2 Site with twenty users

The system model of the wireless network scenario is as shown in figure 1. Four different WLAN sites are selected where each network site connects two users through separate APs. Wireless LAN system is designed with and without load balancer. Load balancing allows APs access of various wireless nodes. For efficient utilization of the system resources every AP gives site management information by employing system functions. To maximize utilization of the available resources, optimizing throughput and reducing response time, the task is redistributed among numerous stations by the load balancer. In the second case, the wireless network is designed without load balancer. Network is configured without a load balancer and it is possible by disabling option of load balancing in the profile off the Wireless system service and can be specified with a Exempt profile. In such scenario, the network does not assign users between APs upon the arrival of new client.

Every LAN network contains clients which are communicating using highest layer protocols. For performance evaluation to application layer protocols namely HTTP and FTP are considered. WLAN network is designed with IEEE 802.11b standard using direct spread spectrum technique. The information is transferred with a packet size of 1024having a slot time of 20µs on a unregulated radio spectrum of 2.4 GHz. Adaptive back-off algorithm is utilized in the MAC layer for contention resolution. Furthermore, wireless system containing four diverse sites are connected with wired system through IP cloud. A Mix of FTP and HTTP users are connected with wired network and are accessing information through APs as shown in figure 2. In the wire-line system HTTP server and FTP server are connected through gateway and system is secured through the use of firewall. Firewall secures the system through continuous supervision of the communicated traffic and preventing unauthorized access.

III. Results and Discussion

In this section, results of the simulation work are presented and analyzed. All the results of both wireless networks with load balancer and WLAN without the load balancer are depicted in graphical form. The blue line displays the findings of the simulation system without load balancer whereas the red color depicts the results of Wireless system with load balancer.

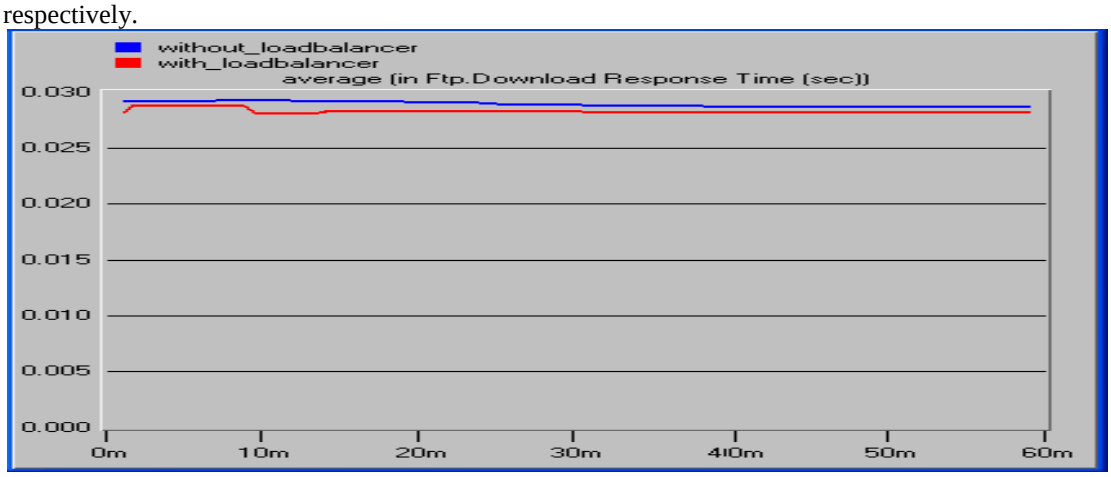


Time (sec)

Fig. 3 FTP Traffic Sent (bytes/sec)

Figure 3 demonstrates the information data traffic transmitted using the FTP protocol. The traffic is measured in bytes per second and the average traffic sent is measured. The peak of the data sent is obtained in between 0ms and 10 ms for both with load balancer and without load balancer simulation environment. The peak FTP traffic sent is 420 and 130 for WLAN without load balancer and with load balancer respectively.

The wireless system is investigated to find the response type for an FTP protocol in both with load balancer and without load balancer as shown in figure 4. It is found that the average download response time with load balancer and without load balancer for FTP protocol is 28.2 ms & 29 ms respectively.

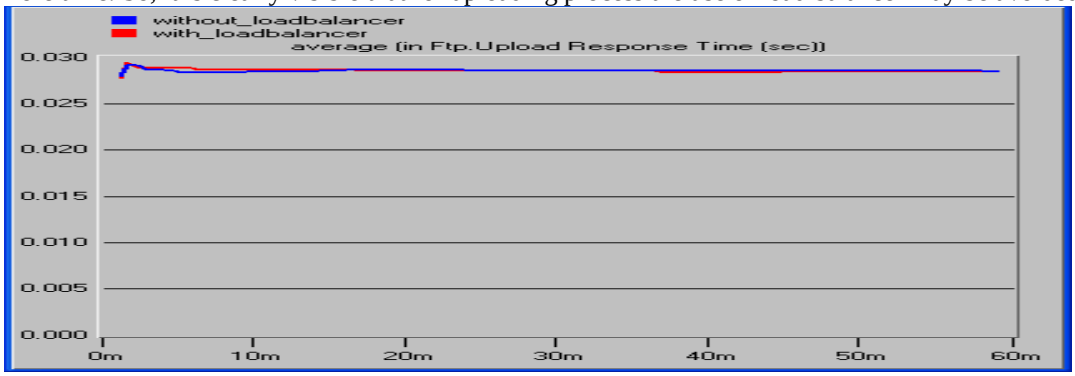


Time (sec)

Fig. 4 FTP Download Response Time (sec)

Further, the proposed system is simulated to know the FTP upload response time for both with the load balancer and without the load balancer and is calculated to be 28.6 ms and 28.5 ms respectively as depicted in fig. 5. For measuring FTP download response time and FTP upload response time the setting of various scenarios are kept constant.

From the measured results it can be deduced that the load balancer is helpful in decreasing the FTP download time, while in the process of balancing, in order to avoid the traffic congestion it rather takes more time. So, it is clearly visible that for uploading process the use of load balancer may be avoided.



Time (sec)

Fig .5 FTP Upload Response Time (sec)

IV. Conclusion

Over the years wireless local area networks havegrown to be the most critical mechanism in wireless technologies, finding a lot of interest from diverse point of views, including end users, researchers and business communitieswith a hope that the technology offers opportunity to availmobile services without the requirement of mobile operators.

This work described a simulation study of an IEEE 802.11b wireless LAN in a campus environment.The simulations are carried out for FTP protocol with and without the use of the load balancer. It is deduced from the analysis that the load balancer is useful in reducing the FTP download time, while in the process of balancing, in order to avoid the traffic congestion it rather takes more time. Thus, it is evident that the use of load balancer is not recommended for up linking processes.

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Biographies: -

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