Evaluating Data drop in Wireless LAN using TTL and Fragmentation

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ABSTRACT

Wireless network refers to the transmission of data and voice over radio waves. The demand for reliable delivery of data in Wireless Local Area Networks (WLANs) is becoming ever more important due to the trend towards converged communication networks. The size of the packets is a very important performance factor. Too small packets yield poor efficiency; too large packets are likely to get dropped. We evaluate data dropped performance metric with and without the use of our technique. OPNET has been used to evaluate the various simulation results. Simulation has been carried for both the scenarios i.e. flow of data packets with TTL and fragmentation and without it. The data drop is reduced to great extent with the use of TTL and Fragmentation and also gives a higher throughput.

Keywords - **Data Dropped, Fragmentation, OPNET, Time-to-Live, Wireless LAN**

I. INTRODUCTION

A wireless LAN or WLAN is linking of two or more computers without using wires. As WLANs eliminate the need of wires for connecting end users, they provide a very easy, viable access to the network and its services. WLAN utilizes spread-spectrum modulation. It enabled mobile communication and Wireless networking. WLANs allow users in a local area, such as a university campus or library; to form a network or gain access to the internet [1].WLAN is standardized as 802.11 by IEEE. The most prominent specifications for wireless LANs were developed by the IEEE working group.

In a typical WLAN configuration a radio transmitter/receiver (transceiver) called a Wireless Access Point (WAP), connects to a wired network from a fixed location using a standard Ethernet (IEEE 802.3) cable connection. At a minimum, the access point receives, buffers, and transmits data between the WLAN and the wired network infrastructure. Figure 1 shows the basic wireless LAN network.

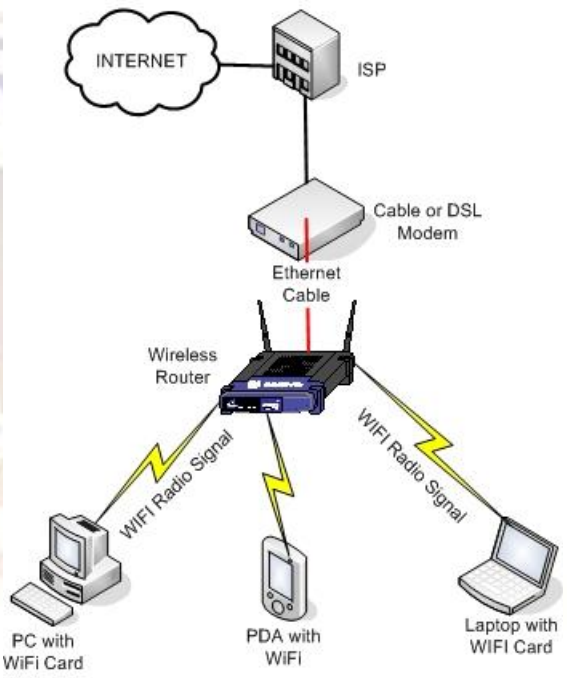

Fig. 1 Wireless LAN Network

The data packet size is a major factor in reliable delivery of data. If the data packet size is too small, it yields poor efficiency and if the size is too large it is likely to be dropped. The data drop will thus result in poor results. So it is must that the data packet should reliably reach its destination. To get this thing done TTL and Fragmentation are used. The simulation result is evaluated in a form of graph.

The paper is organized around four sections. Section I discusses paper's introduction. In Section II, we study the related work. Section III tells about the simulation technology and the results thereafter obtained with the use of TTL and Fragmentation. The conclusion has been summed up in section IV.

II. RELATED WORK

Wireless local area networks (WLANs) based on the IEEE 802.11 standard are one of the fastest growing wireless access technologies in the world today. The low-cost and high-speed WLANs can be integrated within the cellular coverage to provide coverage for high-speed data services, thus

becoming an integral part of next generation wireless communication networks. The performance of Wireless local area network (WLAN) degrades, when congestion conditions occurs with many real applications due too large packet size or other reasons. These effects are a serious hurdle for the deployment and advancement of wireless technologies and, therefore, a congestion control remedy is needed [2].
Peter Dely and Andreas Kassler have discussed about the overhead which is induced by sending the small packets. Due to large MAC layer overhead, applications such as Voice over IP, which send many small packets, show poor performance in WMNs [3]. Packet aggregation increases the capacity of IEEE 802.11-based WMNs by aggregating small packets into larger ones and thereby reducing overhead. In this work, they have presented FUZPAG, novel packet aggregation architecture for IEEE 802.11-based wireless mesh networks. It uses fuzzy control to determine the optimum aggregation buffer delay under the current channel utilization. For different network topologies they show that FUZPAG outperforms standard aggregation in terms of end-to-end latency under a wide range of traffic patterns.

Because medium contention occurs for each packet that is transmitted in a IEEE 802.11 wireless network, transmission of a large number of small packets can be particularly detrimental to performance. As a result of contention overhead, end-to-end delay and energy dissipation increase and the medium utilization decreases. Ramya Raghavendra, Amit P. Jardosh proposed a protocol to reduce contention through concatenation of several small packets into a single large packet, and subsequently transmit this large packet [4]. They proposed IPAC, an IP-based packet concatenation protocol that adaptively selects an appropriate packet size based on the route quality.

In [5], Burleigh et. al. proposed a proactive congestion control mechanism, named Autonomous Congestion Control (ACC), based on a financial model. The proposed solution has a set of predefined rules based on the local information, such as remaining storage capacity, bundle's priority, and bundle's TTL, for accepting or rejecting the incoming bundles. They accept the incoming bundle if the storage overrun does not occur, that is, the projected growth of storage space occupancy over the bundle's residual TTL period does not exceed the total storage space capacity of the node. If the above condition fails, they compute the bundle's acceptance risk to give the bundle a second chance. The risk of accepting a bundle is the worst-case number of byte-seconds of storage space that the bundle will consume. It is simply the product of the bundle size and its residual TTL. They compute a value for each bundle as a function of the priority of the bundle. Then, they compute the risk rate of the bundle as the risk divided by the value. They also keep records regarding the aggregate risk and the aggregate value of the bundles accepted so far to compute the mean risk and the mean value. If the risk rate of an incoming bundle exceeds the mean risk rate over the bundle's residual TTL, then the bundle is rated as the above average risk bundle and they refuse it. Otherwise, they accept the bundle.

III. SIMULATION METHODOLOGY AND RESULTS

OPNET modeler 14.5 is used to develop the simulation and analysis for this paper. The performance metric that is used here is data dropped (retry threshold limit) . A snap shot of the system simulation model is captured in Figure 2. The proposed scenario consists of a wireless Network implemented as a WLAN network, which was modeled within an area of 600 m*400 m. It consists of 50 nodes and simulation goes for total one hour.
The steps used to make the above network are as follows:

1. A subnet in hexagonal shape is designed by using subnet designing module.
2. The LAN is populated with mobile wireless workstations (wlan_station_adv) taken from the wireless_lan_adv module of the object pallet of the OPNET.
3. An access point (wlan_ethernet_slip4_adv) is deployed in the LAN to the communication happen between all the nodes. The access point is a wireless lan based router with one Ethernet and 4 SLIP interfaces.
4. To generate data, Applications are defined by using "Application Config" node for a cell or subnet.
5. To configure the applications "Profile config" node is used for a cell.

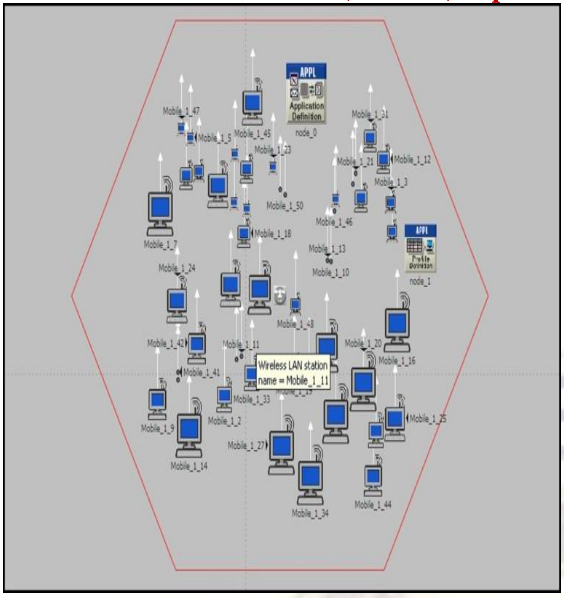

Fig. 2 Simulation Network Model

In this proposed methodology, we have fragmented the packets flowing from sender to receiver into smaller chunks and applied the Time-to-Live constraint on the packets. Simulation has been carried for both the scenarios i.e. flow of data packets with TTL and Fragmentation and flow of packets without them and results have been calculated. Three different applications file transfer protocol (FTP) for high load, hypertext transfer protocol (HTTP) for image browsing and high video resolution are being used to analyze the performance. Simulation focuses on metric data drop of network using TTL (Time-to-Live) and Fragmentation. WLAN Network Parameters and Values for the scenarios are illustrated below:

TABLE 1 SIMULATION PARAMETERS

Network Parameters	**Value**
Size	600*400 meters
Model family	WLAN
Network scale	Office
Data rate	54 mbps
Technology	WLAN
Nodes	50
Operational mode	802.11
Packet interval time	Constant(1 sec)
Packet	4096
	Bytes(Constant)
Fragmentation Threshold	1024 Bytes
Simulation time	1 hour

Now we consider the two scenarios and analyze the scenarios based on data drop. First we take in consideration the data drop without the use of TTL and Fragmentation and then using them.

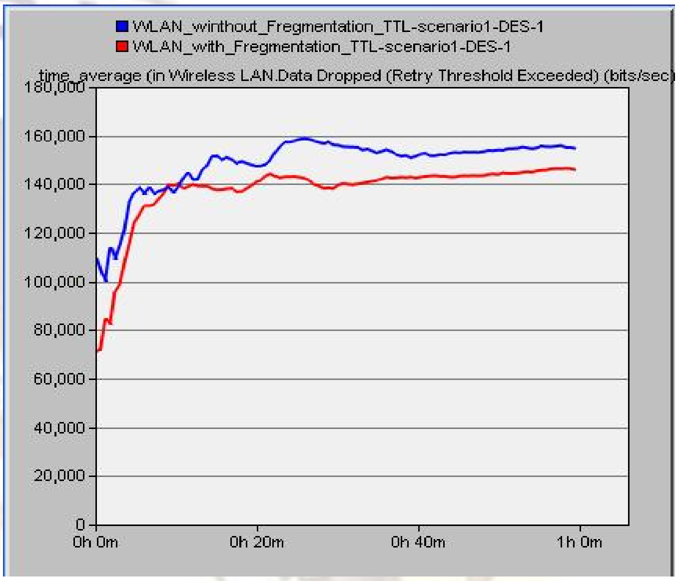

Fig. 4 Overlaid graph for Data dropped (Retry Threshold)

The above graphs shows us that the data drop is reduced to great extent with the use of TTL and Fragmentation whereas, large amount of data is dropped when there is no use of TTL and Fragmentation. The use of TTL and fragmentation results in reduced buffer overflow as the packets are fragmented into chunks. The data drop in the starting is less with the use but it goes high around after 10 minutes. The Data drop rate after this never goes high with the use of TTL and Fragmentation.

IV. CONCLUSION

In this paper, we analyze the network performance in terms of data dropped. Simulation results show that the performance of the network could be improved with TTL and fragmentation for large packets be chosen. If the value of TTL is kept high then the probability of occurrence of congestion in network becomes very high and if the values of TTL is very less then the data loss in the network would increase. The data packets using TTL and fragmentation flowing in the network performs better giving higher throughput.
There is always a scope to improve the concluded results by calculating the proper values of the

fragmentation size and TTL and other parameters that are required for the good performance of the network.

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