

Analysis of Packet loss and Throughput In Heterogeneous Mobile Ad-hoc Networks over UDP

Jasmine Yadav, Nidhi Garg, Nipun Sharma

Abstract— The computer networks have evolved themselves into an altogether new generation with Mobile Ad-Hoc networks. The Mobile Ad-Hoc Networks are increasingly becoming more sophisticated and complex in terms of topology, routing and security. The new age MANETs incorporate routing of heavier traffic classes like audio, video and multimedia. It has become important to study the performance characteristics of the multimedia traffic class in MANETs that includes packet loss rate and throughput. In this paper we will discuss these performance parameters under different scenarios like Bandwidth, channel error rate, delay and fragment size. The simulation results are obtained in the different parameters to reduce the packet loss rate and increase the throughput.

Index Terms— Bandwidth, Delay, Error rate, Fragment size, MANET, Packet loss rate, Throughput.

1 INTRODUCTION

RECENTLY, the demand of wireless communication between mobile users is growing day by day. In wireless communication Mobile Ad-hoc Networks is one of the networks which are susceptible to all those problems that are existing in wireless networks [1], [2]. As the technologies like Bluetooth, IEEE802.11 is increasing the realization of multimedia applications over MANETS becomes more realistic [13]. In multimedia applications video files play an important role in Mobile Ad-hoc Networks [14]. The quality of video is perspective issue in MANETs [11], [12]. Many researchers evaluate the various parameters like Decodable frame rate, packet loss rate, throughput, PSNR etc. under 2 Procedure for Paper Submission various routing protocols and algorithms. In today era, as in higher bandwidth network MTU (Maximum Transmission Unit) has increasing significantly. To study the effect of larger fragment size and thus smaller fragmentation on a video trace files becomes an important issue. In the proposed research work the multimedia traffic carried over the UDP is tested with different fragment sizes under various channel error rate for the following parameters- packet loss rate and throughput.

In this paper we present a relatively heterogeneous network with both UDP and TCP traffic flowing in the network. If we study the performance of UDP traffic class in a network, it becomes easier to predict the behaviour of multimedia traffic

class as it will be sent over the UDP in the simulations [9].

The remainder of this paper is organized as follows. In Section 2 we present the performance metrics of our simulation. Section 3 provides the Simulation Environment. Section 4 shows the results analysis by showing the different graphs considering different parameters. Section 5 presents the concluding remarks and future scope.

2. Performance Evaluation Metrics

We analyse the UDP traffic on the main router to router link by considering the Throughput and Packet loss parameters

Throughput: Throughput or network throughput is number of bits delivered successfully per second to the destination. It is the sum of bits received successfully by all destinations. This data may be delivered over a physical or logical link. The throughput is measured in bits per second (bps).

Total Packet loss: Packet loss is the failure of one or more transmitted packets to arrive at their destination. In digital communication, Packet loss is distinguished as one of the three main error types, the other two being bit error and spurious packets caused due to noise[5] A problem of packet loss is much more complicated in Mobile Ad hoc Networks because wireless links are subject to transmission errors and the network topology changes dynamically[6].

3. Simulation Environment and Network Parameters

The topology of the network created

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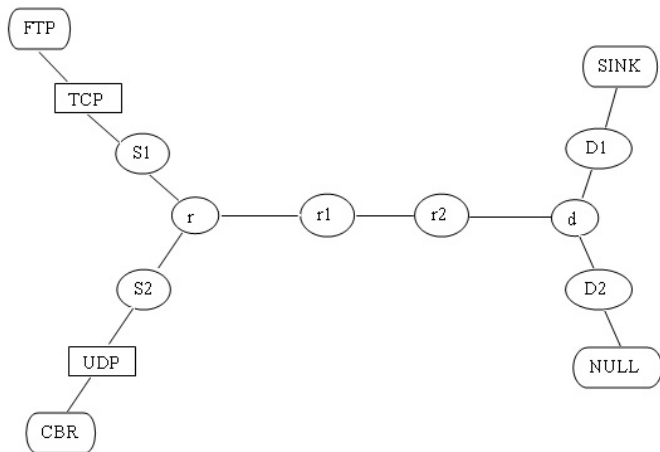


Fig. 1. Simulation Scenario

The network has 2 source nodes (S1 and S2), one generating TCP traffic which is attached to FTP agent and the other generating UDP traffic connected to CBR (Constant bit rate) be transferred at the destination node (d) [7], [8]. The three routers are set in between source nodes and destination node. All the three parameters bandwidth, error rate, fragment sizes are varied on the link between r1 and r2 by keeping delay constant as shown in Fig. 2. The destination node (d) is connected to two receiving nodes D1 and D2 in which sink agent that is used to record the information for TCP-based application at the receiver side attached to D1 and other is null agent that is used to record the information for UDP-based application at the receiver side attached to D2.



Fig. 2. The network parameters are changed on the link (r1-r2)

The parameters are changed in the network. In first case, the *bandwidth* of the main router to router link (r1-r2) is changed keeping the other network parameters unchanged. In the second scenario the *delay* of the main router to router link (r1-r2) is changed keeping the other network parameters unchanged. In the third scenario the *error rate* of the main link is changed and in the fourth scenario the *packet size* is changed.

4. Results Analysis

We have analyzed the results for two different parameters- Packet loss rate and Throughput. Here Simulation results are represented in the form of bar graphs as follows:

- Packet loss rate

Effect of varying bandwidths and error rate: for 10 ms delay

Fig. 3. Shows the effect of fragment size on PACKET LOSS RATE. We have kept the delay constant and analysed with varying bandwidths and error rate.

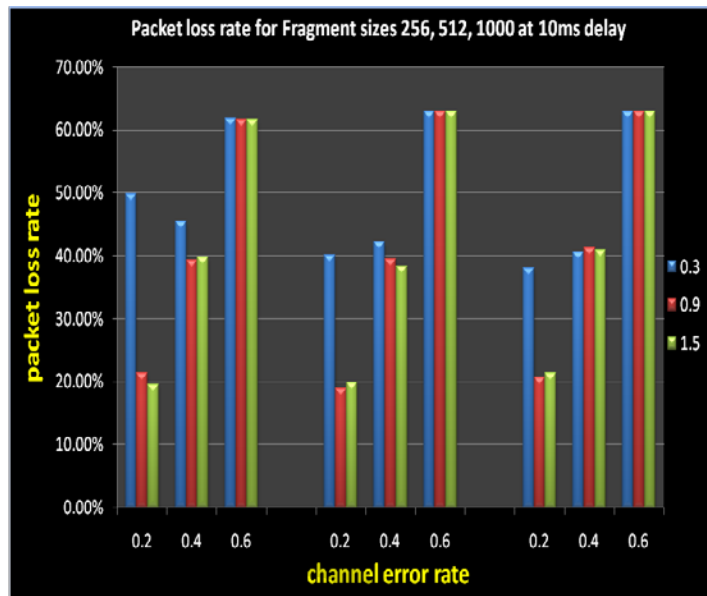


Fig. 3. Packet loss rate for different fragment sizes at 10 ms delay

Effect of varying bandwidths and error rate: for 50 ms delay

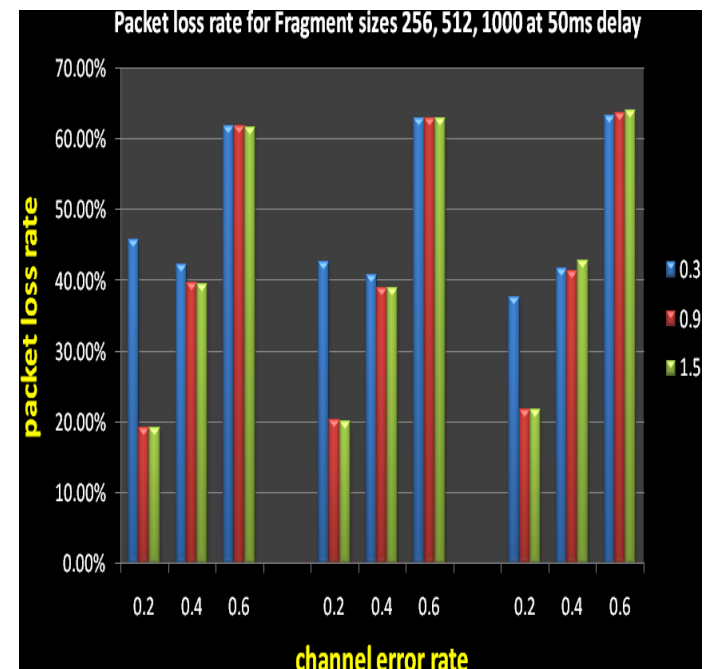


Fig. 4. Packet loss rate for different fragment sizes at 50 ms delay

Effect of varying bandwidths and error rate: for 100 ms delay

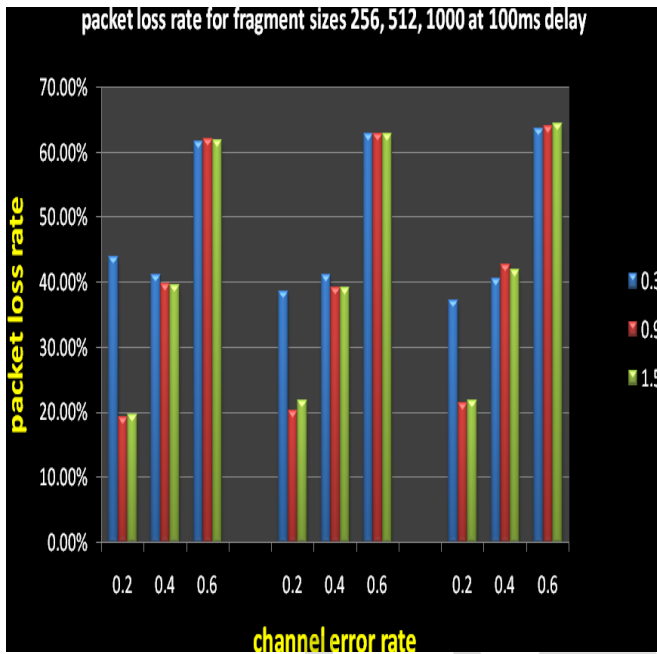


Fig. 5. Packet loss rate for different fragment sizes at 100ms delay

Figs. 3, 4 and 5 shows the impact on packet loss rate for different fragment sizes by varying Bandwidth, channel error rate keeping delay to be constant on main router to router link i.e. ($r1-r2$). At 10ms delay the packet loss rate decreases as the packet size increasing at lower error rate as shown in fig.3 when packet size is 1000 bytes the packet loss rate is reduced comparatively to other fragment sizes such as 256 bytes and 512 bytes. The same trend can be observed at 50ms delay and 100ms delay. This is important to reduce this parameter in multimedia transmissions in order to predict the video quality be better.

• Throughput

In this we are analyzing the throughput in the different bar graphs by varying the network parameters:

Effect of varying bandwidths and error rate: for 10 ms delay

Fig. 6. shows the effect of fragment size on THROUGHPUT. We have kept the delay constant and analysed with varying bandwidths and error rate.

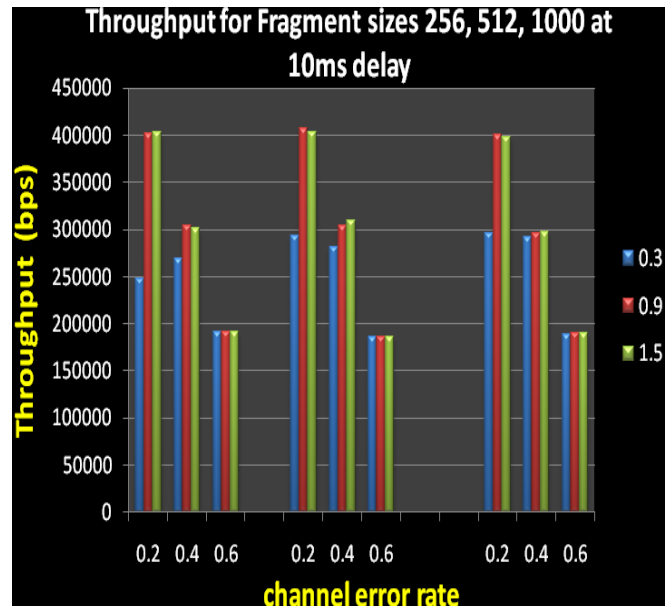


Fig. 6. Throughput for different fragment sizes at 10 ms delay

Effect of varying bandwidths and error rate: for 50 ms delay

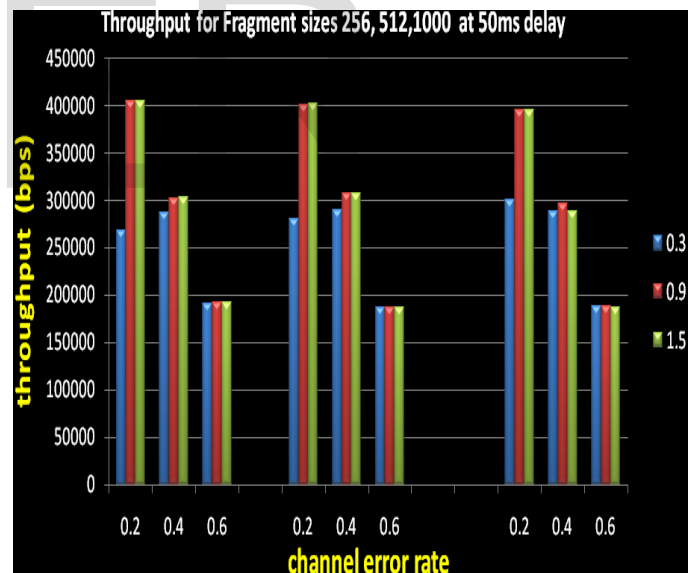


Fig. 7. Throughput for different fragment sizes at 50 ms delay

Effect of varying bandwidths and error rate: for 100 ms delay

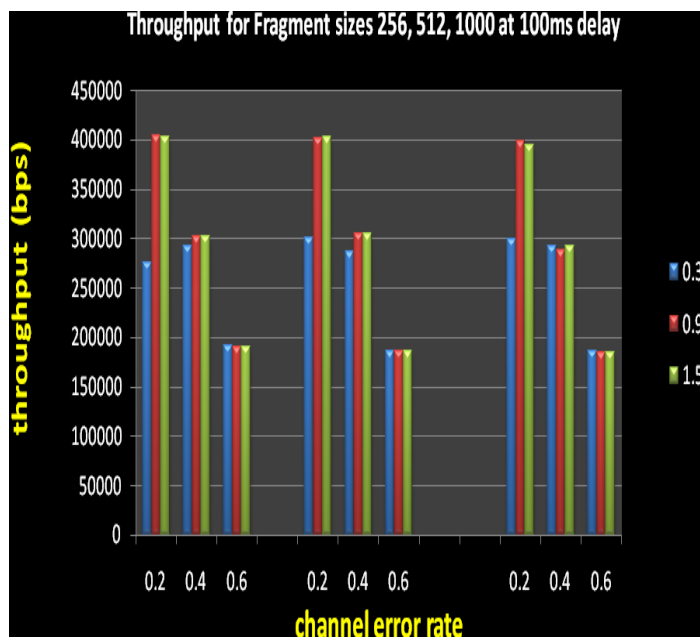


Fig. 8. Throughput for different fragment sizes at 100 ms Delay

Figs. 6, 7 and 8 shows the impact on throughput for different fragment sizes by varying Bandwidth, channel error rate keeping delay to be constant. At 10ms delay throughput increases as the packet size increasing at lower error rate as shown in fig.3 when packet size is 1000 bytes throughput is increased comparatively to other fragment sizes such as 256 bytes and 512 bytes. The same trend can be observed at 50ms delay and 100ms delay. Throughput should be increased in multimedia transmissions because this parameter provides successful delivery of packets to the destination for improving the video quality.

5. Conclusion and Future Scope

In this paper we find out the effect of different fragment sizes having varying bandwidth, delays and channel error rate on the packet loss rate and throughput based on above topology. By comparing the different graphs on the basis of various performance metrics we have reached to conclusion that when the packet size increases at lower error rate for all bandwidths there is a *marginal decrease* in the packet loss rate and when the error rate is higher there is a *marginal increase* in the packet loss rate. There is a *marginal increase* in the throughput when the packet size increases at lower error rate (0.2 and 0.4) for all bandwidths and there is a *marginal decrease* in the throughput when the error rate is higher (0.6) at all bandwidths.

Thus the paper presents a novel technique of optimization of the traffic for UDP classes under various constraints of network parameters that may be useful in the analysis of study in multimedia routing in MANET.

In the future scope we can analyse the TCP Traffic using various routing protocols with different fragment sizes under various network parameters that may be useful to predicting the behavior of quality of video in Mobile Ad-hoc Networks.

References:

- [1] S. P. Alampalayam, A. Kumar, and S. Srinivasan, "Mobile Ad hoc Network Security – a Taxonomy," in *Proceedings of ICACT Conference*, 2005, pp. 839-844.
- [2] Naruephiphat, W, "Routing Algorithm for Balancing Network Lifetime and Reliable Packet Delivery in Mobile Ad hoc Networks," in *ubiquitous, Autonomic and Trusted Computing*, Conference publications, 2009.
- [3] Nipun Sharma, "ANALYSIS OF SECURITY REQUIREMENTS IN WIRELESS NETWORKS AND MOBILE AD-HOC NETWORKS" in *GESJ: Computer Science and Telecommunications 2010| Vol No.5 (28)*
- [4] Pankaj Rohal, Ruchika Dahiya, Prashant Dahiya, "Study and Analysis of Throughput, Delay and Packet Delivery Ratio in MANET for Topology Based Routing Protocols (AODV, DSR and DSDV)" in *international journal for advance research in engineering and technology Vol. 1, Issue II, Mar. 2013 ISSN 2320-6802*
- [5] http://en.wikipedia.org/wiki/Packet_loss
- [6] Yi Lu Yuhui Zhong, "Packet Loss in Mobile AdHoc Networks" Bharat Bhargava *PurdueUniversity*, bb@cs.purdue.edu
- [7] <http://csie.nqu.edu.tw/smallko/ns2/measure.htm>
- [8] Network Simulator 2 – <http://www.isi.edu/nsnam/ns/>
- [9] Dr. Nipun Sharma, Ms. Jasdeep Kaur, Ms. Jasmine Yadav, "Implementation and Analysis of Fragmentation of MPEG-4 Traffic in NS-2 integrated with Evalvid" *Oeconomics of Knowledge*, Volume 5, Issue 2, spring 2013.
- [10] Vassiliou, Pavlos Antoniou, Iraklis Giannakos, Andreas Pitsillides, "Requirements for the Transmission of Streaming Video in Mobile Wireless Networks"
- [11] en.wikipedia.org/wiki/Throughput
- [12] "Multimedia communications Applications, Networks, Protocols and Standards" by Fred Halsal
- [13] "Multimedia systems" by John F. Koegel Buford University of Massachusetts Lowell.
- [14] "Computer networks" by Mayank Dave Associate Professor and Head Department of Computer engineering & Department of Computer Applications National Institute of Technology, Kurukshetra.

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