An Effective Method For Delay Optimization To Improve Qos In Mobile Ad-Hoch Networks

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Abstract: This paper discuss about delay optimization approach that improves the QOS for multimedia traffic in Mobile ad-hoc Networks (MANETs).For many application Multimedia transmission over MANETs is important. But it has several challenges associated with packets size, delay, loss-tolerance level and estimation in buffer size. The minimization of delay and receiving packets in correct order is essential for effective multimedia transmission. In wireless network 802.11e and 802.11b performs well but its response is poor in MANETs for multimedia traffic. To overcome defect knapsack algorithm approach is used. Thus maximization of in-order packets and minimization of out-of-order packets is achieved simultaneously by Knapsack algorithm. This method considers the buffer internal characters and adjusts dynamically the buffer usage so that each node can transmit the packets in the defined order to its following nodes. The detection of buffer size and packet size which helps to reduce the delay, improves the ability to receive packets in the correct order and reduces out-of-order packets in the buffer at intermediate nodes. It controls the loss of data packets during transmission and validate this approach using network simulator.

Keywords: Buffer size, Delay Optimization, Knapsack Algorithm, Multimedia Data.

I. INTRODUCTION

Mobile Ad-Hoc Networks is a type of infrastructure less networks in which nodes are directly connected without any basestations.When nodes are at direct range they can communicate directly otherwise communication is established through intermediate nodes. since the communication through intermediate node increases the delay that results badly in multimedia transmission. Thus MANETs need additional support for application like video conference and video on demand. The main two parameters used for multimedia traffic are delay and order of packet received. Thus each packet has to reach the destination before deadline. Otherwise packet loss or out–off-ordering of packets occurs due to delay.

A .Literature Survey:

In reference paper [1] Chee Kheong Siew developed the method to solve thread possessed by Rayleigh fading in accurate data transmission. High-level data link control (HDLC) protocol was used. This method is able to reduce the delay due to fading but small packet size results in higher protocol header overhead. Liu & jia [3] proposed flooding algorithm to improve the order of packets.

Wang & Zhang [5] describes about out-of-order packet and there response to improve performance of MANETs. The standard graph based algorithms such as Dijkstra, Greedy, Bellman-Ford, [12] are used to find shortest path and optimize the delay in networks. These algorithms consider the basic network parameters such as queuing delay, propagation delay, transmission delay, processing delay and bandwidth. These parameters are mainly affected by the external to the node buffers. Since packets are transmitted through node buffers to reach the destination, the packets which are not coming in a defined order are stored within the buffer itself.

When these packets fill the buffer space and remaining incoming packets are dropped. This investigates the effective usage of the node buffer, for transmitting the packets in correct order. Thus maximization of in-order packets and minimization of out-of-order packets is achieved simultaneously by using Knapsack algorithm. This method considers the buffer internal characters and adjusts dynamically the buffer usage so that each node can transmit the packets in the defined order to its following nodes.

The paper is organized as follows. The second section describes about delay and out-off-sequence. Third section describes about block diagram for delay optimization. Fourth section explains simulation results that tell the viability of this approach. Then conclude the next section.

II. DELAY AND OUT-OF-SEQUENCING

End-to-end delay is the time taken to transmit a packet along its entire path to the destination. The main factors that cause delay which includes overhead over communication link, slow transmission rate of the link, position of the hosts. The processing delay, queuing delay, transmission delay, propagation delay are the main delay that encounters a network. In addition to all this delay there comes another delay called buffer delay. Thus source node wants to send a packet to the destination. Initially the packet will be fragmented and each fragment will be identified by a sequence number. Time taken to order the sequence of packet received is "buffer delay". In multimedia data traffic over MANETs (video conferencing etc) this delay is important.

A.Out-of-Sequencing:

The packet sends the delivery of data packets in a different order from which they were sent. Out-of-order packets may not affect performance if time between their expected arrival and their

actual arrival is very less. Consider an example; if two packets arrive in reverse order, but both packets arrive within 1 ms, it does not make any problem. If out-of-order packets arrive after quite a delay, or many out-of-order packets are present, there will be degradation in performance of the network.

Out-of-sequence packet can be caused by three different events,

1. Retransmission: It happens when ever the packet loss occurs. The network

   packet loss is detected by using retransmission timer and fast retransmit timer
2. Network duplication: This mainly occurs within routing loop. This happens when a non sender send a duplicate of the packet
3. In-network reordering: This naturally occurs in the network, Since the packets are transmitted as fragments as it moves through different path in the network its order may change.

III. PROPOSED SYSTEM

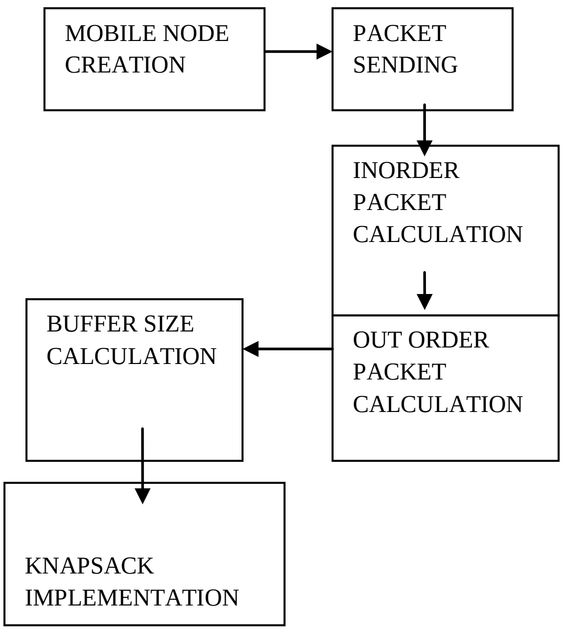

Figure1. Block diagram of proposed system

A. Mobile node creation

The steps included system is shown in Fig.1 .Initially parameters of the node are defined. The parameters which includes channel type, propagation model, routing protocols, queuing types etc. Channel type describes the type of channel used for broadcasting whether a wired or wireless channel. Radio propagation model describes how the radio waves are propagated. A single line-of-sight path between two mobile nodes is seldom the only means of propagation. The two-ray ground section model considers both the direct path. Mac type describes node how to share broadcast medium. link layer tells how to check packet integrity. Routing protocol using is AODV which is an On-demand routing protocol

B. Packet sending

TCP is used for transferring packets. It is a reliable congestion protocol which is used to provide reliable transport of packets from one host to another host by sending acknowledgements on proper transfer or loss of packets. File Transfer Protocol (FTP) is a standard mechanism provided by the Internet for transfer of packets from one host to another. In order packet , out order packet,buffer size calculation are done simultaneously by using knapsack algorithm.

C. Knapsack Implementation:

The mathematical model for delay optimization is as follows. For this input first-in-first-out (FIFO) buffer is considered .The capacity of the buffer is taken as B. Here Di and Do is taken as the input and output data rate of the buffer. At *Ta* time the packet arrives the buffer and these packet are transmit at time *Tt*. Delay is considered as *Td*.

The synchronization constant, *K* can be defined as the ratio of input date rate and output data rate. That is,

$$K=Do/Di \quad \text{……………………….(1)}$$

For this mathematical model, assumptions are

1. The numbers of packets in the buffer is taken as n, with packet size p. So, the capacity of the buffer B is,

   $$B = n * P \quad \text{………………………(2)}$$
2. For each cycle Tt the buffer is full. So the total time taken by a packet to come out of the buffer is

   $$n * Tt \quad \text{….............……(3)}$$
3. Synchronization constant K is between 0 and 1.If K > 1, then there is no significant transmission constraint. That is, K = 1 represents perfect synchronization, and K not 1 represents imperfect synchronization.

The ratio of buffer capacity to the total time taken by the last packet to transmit out is known as output data rate

$$Do=B/n*Tt \quad \text{………………………… (4)}$$

Input data rate is given by the equation

Di=Packet size/(Arrival time + delay time)

Di=P/(Ta+Td) ………………………….(5)

Suppose number packets received out-of-order is O_R, in-order is I_R and P_L is the packet loss

Average number of packets which will become in-order within the buffer are IB1; IB2….; IBn at different instants of time when buffer sizes are b1; b2; …; bn. The objective of the system is to decrease the delay by increasing the in-order packet to be transmitted to destination and increasing the throughput by reducing the out-order-packet to the buffer. This improves the QoS for multimedia transmission in MANETs.

We assume that packet are stored completely and consider two tuples of size n: one represent the inorder packets ($I_{B1}I_{B2}I_{B3} \ldots I_{Bn}$) and the second represent the new value of buffer size (b1, b2, b3,…, bn).

To find out the in order packet subset S ⊆{ P1,P2, . . . ,P to fill the buffer such that

Maximize $\sum I_{Bi}$, where Bi ε S

Subject to constraint ∑bi < B

Let construct a two-dimensional array I_{BK} [0. . .n,0. . .B]. The entry I_{BK} [i,b] is the maximum in-order packets of any subset as packets (1, 2, 3, . . , i) of size at most b the present at buffer for a particular instant of time. After getting all the entries of this array, then entry I_{BK} [i,B], gives maximum inorder packets that can increase order transition. The optimization criteria is given by the equation(6)

$I_{BK}[I,bi]$=Max{

$$I_{BK}[i-1,bi]I_{BJ} + I_{BK}[i-1,bi - S_{Ti} * \frac{P}{K}]\}$$

……………………………………….(6)

I_{BK}[I,bi] represents maximum value to fill the packets that are in-order within the available buffer size. I_{BK}[i - 1,bi] keep i - 1 order of packets. $I_{BK}[i-1,bi - S_{Ti} * \frac{P}{K}]$; calculate the value of i - 1 order of packets with bi bytes minus storage of the buffer at the i^{th} stage.

Total out-of-order packet received in a buffer with capacity B is given by the equation

$$P_i = bi * \frac{O_R}{P}[1 - \frac{H_d}{P}]$$ ……………………(7)

Packets that become in-order inside the buffer is;

$$I_{Bi} = (P_i + \sum S_{Ti})I_R$$ ……………………….(8)

Storage of the buffer is;

$$S_{Ti} = P_i - I_{Bi}$$ ………………………….(9)

Equations (7) - (9) are useful to compute number of out-of-order packets received, number of packets that become in-order and storage filled in the buffer. These values are helpful in finding the optimal solution according to Eq. (6) for in-order packet transmission between source and destination.

IV. SIMULATION RESULTS

Consider a MANET of 50 nodes and the size of the packet is 256 bytes for simulation. Fig 2.shows an end to end delays for multipath data using with and without knapsack algorithm. The X-axis shows packet id and y-axis shows end to end delay in ms. From the fig2, the delay experienced by each packet is reduced by using knapsack algorithm. For example packet 1 experience a delay of 6ms before using knapsack but delay is reduced to 4ms after using knapsack algorithm.

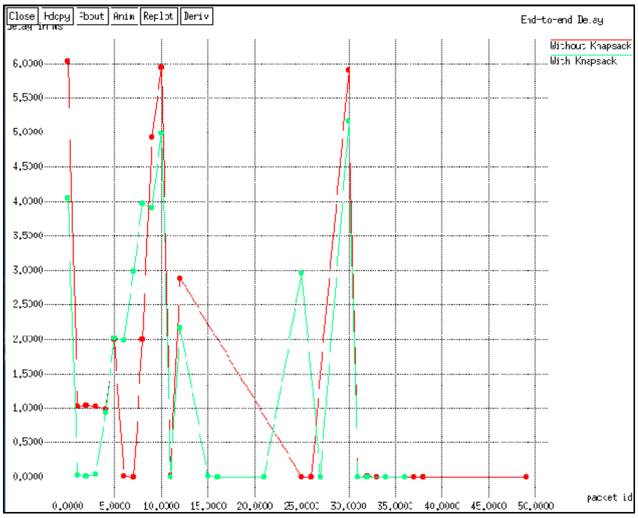

Figure2. End-to-end delay vs packet ID

The second parameter that consider to analysis performance of the network is throughput. The fig 3. shows the throughput in multipath data rate. Before using knapsack algorithm the total

number of bytes that is successfully reaching the destination is 18*10^3bytes.but later the bytes successfully reaching destination is increased to 22*10^3bytes.

Packet delivery ratio (PDR) is the ratio of received number of packets to number of packets that has been send. Fig.4.shows the packet delivery ratio in proposed system. Initially it is almost same for both scenario but later the use of knapsack algorithm increase the PDR.

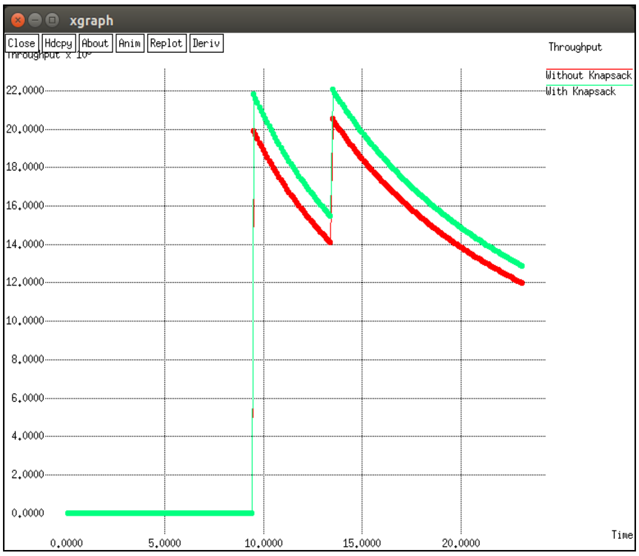

Figure 3.Throughput vs time

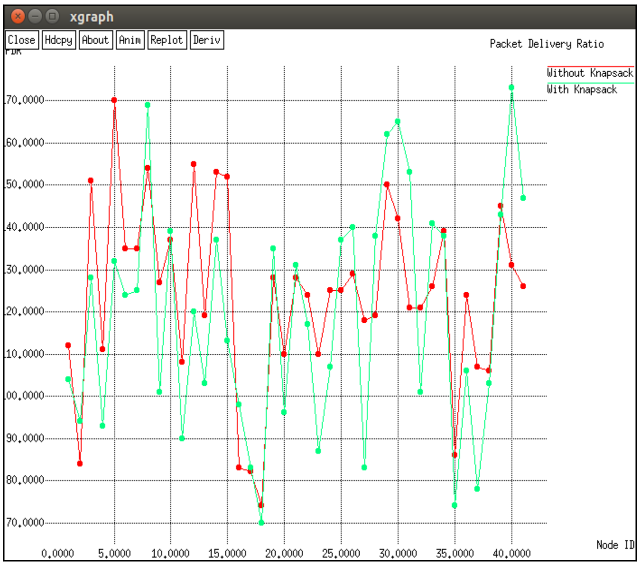

Figure 4 PDR vs node ID

V. CONCLUSION

The existing algorithm considers the basic network parameters such as queuing delay, propagation delay, transmission delay, processing delay and bandwidth. These parameters are mainly affected by the external to the node buffers. Since packets are transmitted through node buffers to reach the destination, the packets which are not coming in a defined order are stored within the buffer itself. When these packets fill the buffer space and remaining incoming packets are dropped. The proposed system investigates the effective usage of the node buffer, for transmitting the packets in correct order. Thus maximization of in-order packets and minimization of out-of-order packets are achieved simultaneously by using Knapsack algorithm. This method considers the buffer internal characters and adjusts dynamically the buffer usage so that each node can transmit the packets in the defined order to its following nodes. The simulator result shows the improvement in multimedia data transmission in MANETS through different parameters such as end to end delay, throughput, and packet delivery ratio.

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