ENHANCEMENT OF QOS IN MULTIHOP WIRELESS NETWORKS BY DELIVERING CBR USING LB ALGORITHM

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Abstract

One of the most complicated issues is to measuring the delay performance of end to end nodes in Multi-hop Wireless Networks. The two nodes are communicating via hopping over the multiple wireless links. The fact that is each node has to concentrate not only its own generated traffic, but also relayed one. Observing unfairness particularly for transmissions among nodes that are more than one hop Most of the existing works deals with the joint congestion control and scheduling algorithm, which does not focusing the delay performance. In turn, considering the throughput metric alone although for congestion control flows, throughput is the repeated difficult performance metric Packet delay is also important because practical congestion control protocols need to establish the timeouts for the retransmissions based on the packet delay, such parameters could significantly impact the speed of recovery when loss of packets occurred. The related issues on the delay-performance First, for long flows, the end to end delay may grow in terms of square with based on the number of hops. Second, it is difficult to control the end-to-end delay of each flows. TDMA schedules the transmissions in a fair way, in terms of throughput per connection, considering the communication requirements of the active flows of the network. It does not work properly in the multi-hop scenario, because it is generated only for single hop networks, We propose The Leaky Bucket Algorithm, in addition to joint congestion control and scheduling algorithm in multi-hop wireless networks. The proposed algorithm not only achieves the provable throughput and also considering the upper bounds of the delay of each flow. It reduces the transmission time by delivering packets at a constant bit rate even it receives the packet at a busty way.

Keywords- *Multi-hop wireless networks, congestion control, Performance, Delay, Flow, Throughput.*

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1. INTRODUCTION

In cellular, WLAN, The communication involves the last link between the base station and end system. Whereas in Multihop wireless networks having one or more intermediate nodes along the path that receive and forwarding packets via wireless links It can able to extend the coverage of the network and improve the connectivity. In Multi hop Wireless Networks, The Joint Congestion Control and Scheduling Algorithm based problems has been deeply investigated in the literature [1].

Frequently, the non reducing and utility concave function with each user is associated and a cross layer utility maximization problem is regulated, To enhance the use of total system that the scheduling algorithm supported the corresponding rate vector. One suitable advantageous settlement of this problem is max-weight back pressure scheduling algorithm combined with congestion control module at the source [2]. In a telecommunication channel, through the integration of various mechanisms at various design layers, Information flow is achieved with supporting the information transfer based on the needs of applications. Particularly in wireless networks, In order to support the information transfer the unfairness way of interaction at different layers is evolved.

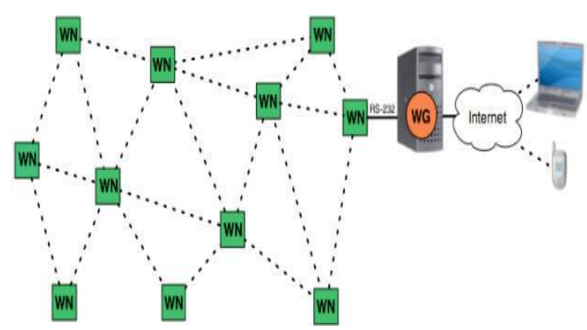

Fig 1: Multihop wireless network

The issues that are found when extending the progress of general resource allocation for multi hop wireless networks. [2], In the loosely coupled cross layer, the clean state optimization problem to multi hop resource allocations results normally. The algorithm congest to map the different layers, (transport, network and MAC/PHY) coupled through the lots of information passed with protocol stack.[3], The most important challenge in designing a wireless network, distributed Scheduling algorithms is needed so that it can efficiently share the bandwidth properly. Nowadays few algorithms allow a node to interact a single node at a time.[4], The Distributed wireless scheduling algorithm that can guarantees to attain the fixed fraction of the region without modifying the size of the network. The parameter clearly handles the exchange between the control overhead and throughput performance of the scheduler. Most of the algorithms in an effort to increase the scheduling performance without considering the control overheads This is a clear problem that in view of designing wireless resource usage. Particularly for large networks using unaccounted portion of resources for control signals. The algorithm performs well and used for the remaining portion of the data transmissions.[5] The cross layer approach having better performance bounds when compared to layered approach, because it does not modeling the rate control and scheduling together. However, it requires prior knowledge of the capacity region in order to Choose such a rate region. On the other hand, the cross layered approach to rate control can allocate the data rates without requiring previous accurate knowledge of the capacity region. It means the network jointly optimizes both the user data rates and resource allocation of the underlying layers.

Our proposed algorithm not only achieves the provable throughput guarantee but also leads to explicit upper bounds of the end to end delay of every flow. When compared with existing works deals with scheduling algorithm, in addition to joint congestion control and scheduling algorithm, The leaky bucket algorithm can able to guarantees the bandwidth by delivering packets with a constant flow regardless of the incoming packets in a busty manner.

2. RELATED WORK

The number of physical and access layer parameters are controlled and combined with the functions of higher layers such as transport, routing.[1]. Moreover, the specific layer associated with state information becomes available beyond another layer as certain functions can uses that information. Generally, The functions of the physical and access layer includes power control; and allocation of channels. After that it performs the selection of frequency and carrier in OFDM (Orthogonal Frequency Division Multiplexing) in spread spectrum, The spreading of codes and adjustments of rates are performed as well as allocation of the time slots can also achieved in TDMA Systems. Additional choices of the wireless network designs may include the modulation and the coding rate. These above parameters are based on the quality of the channel and desired rates. In order to the interference property of the wireless node, it cannot be independently viewed. So presenting the model to hold the cross layer interaction from physical layer to transport layer in wireless networks, it allows traffic forwarding nodes, including datagrams and virtual circuits. The link transmission rates are determined by transmission rate function C(I,S)

$$\mu (t) = C (I(t),S(t))$$

Here, S(t) represents the network topology state with time slot t. I(t) represents the link control action taken by the network with time slot t.

Optimization based approaches has already been used in resource allocation problems in communication networks [2]. Internet congestion control can be treated as the distributed aspect of optimization to enhance the system performance. Such kinds of approaches were resulted in briefly having the knowledge of TCP. Particularly, the wireless network is multi access shared medium where the users interfere with each other and the capacity also time varying due to mobility, multipath. This causes interdependencies across users and the network. So declaring clean state optimization resource allocation for multihop wireless networks. Instead of temporal unfairness, here considering the other forms of QoS

- *Fairness in utility:* Each user receives a fraction of the total utility value.
- *Minimum data rate requirement*: Each user receives the data rates of bits per second.
- *Proportional Fairness*: The objective is to achieve the proportional fair.

The routing and link activation policy attained here guarantee to stabilize the network. [3] (i.e giving maximum throughput). This is Particularly relevant in wireless networks where distributed algorithm are used for comparisons. Based on these observations, a proposed distributed framework that repeatedly determines the accurate solutions to maximum weight matching problems and combines the sequential solutions. As discussed before [3], the merge operation does not need to select the preferable matching. The framework involves the two different phases. The first phase contains the solution of the maximal matching problem is obtained. The second phase involves comparing and merging the successive accurate solutions. Here proposing three alternatives to required information for comparison. First approach is based on the information collected from the local components of the network. Second approach is based on the Gossip algorithm [3], investigate the value by random manner in order to compute the old and new solution. The advantage of the algorithm is it does not need any infrastructure. Third approach deals with the estimation of old and new solutions distributedly calculating the minimum values of random exponentially variables.[4]. The task of wireless scheduling is the concurrent presence of two characteristics. Interference based transmissions, and the need of real time distributed implementation. For any scheduling algorithm, the interference based effects results in maximum values of the data rates. In practice, the need for distributed implementation dynamically leads to overhead. As mentioned above, for data transmissions, the power and bandwidth resources are used as the same time. Instead of be wasted of control signals.

The cross layer control problem consists of two elements. First is to determine the users that which imposing the data into the network. [5] Second is to determine the when and at what rate each link can decide to transmit the data over the network. [6] Different wireless networks especially having the different constraints of interference. Bluetooth networks can satisfy the sharing model of exclusive node. Whereas, IEEE 802.11 having the limited amount of frequencies and they do not allow the same frequency in the two hop networtks. [7] Each and every node having the locally unique frequency. When multiple transmissions occur, if they never have a common node, it can proceed with interference. The link maintains the matching which are active at any time. Here presenting a two tier approach that attains the maximum fairness for multihop networks. First steps involves the sharing the bandwidth of each node for each session at its path, and releases packets for transmissions. Second step schedules the transmission of the released packets.

3. METHODOLOGY

3.1 The Joint Congestion Control

In this algorithm, whenever the packet arrives at a heavy traffic router, the packet is fetched at random manner from the FIFO based buffer with the arrived packets are compared. Both of the packets are dropped if they arrive at the same flow. Otherwise, the randomly chosen packets are kept aside and newly arriving packets are collected and put into the buffer depends on the congestion level. It is really a simple and good algorithm that does not require any special data structure. This algorithm does not deliver good performance when the large number of flows compared with its buffer space.

3.2 Scheduling Algorithm

This is the enhanced version of distributed scheduling algorithm with low complexity. Here, each time slot having an initial scheduling property. And it is further divided into n mini slots. Each link has to be scheduled and selected according to the scheduling slot as mentioned above.

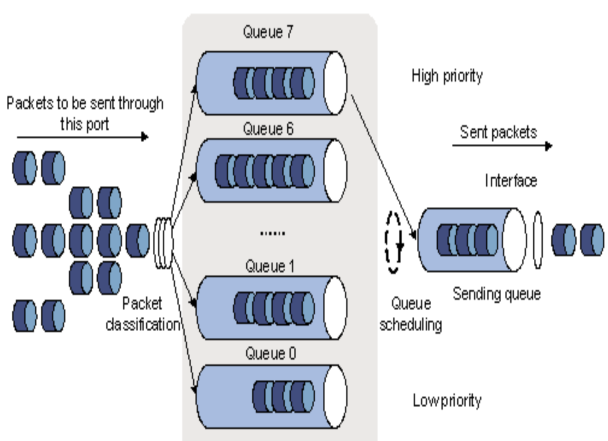

Fig 2: Operation of scheduling algorithm.

The selected links are transmits the packets by rest of the time slots. Each link randomly selects a mini time slots and transmitting packets. When the timer associated in the slot got invalidated, the link already received the same packet as before from the neighbor. It makes the transmission interference, occurring of collisions, and finally results in transmission failure.

3.3 Leaky Bucket Algorithm

The algorithm is the most promising method for the prevention of congestion control in networks. For QoS support, the algorithm maintains the dynamic token generation at intervals. The information may be network lost, resource became useless etc, the input traffic must be controlled at the appropriate level of buffer occupancy.

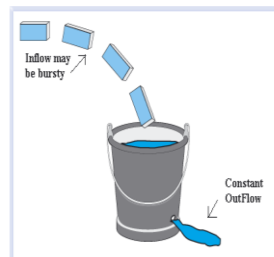

Fig 3: Leaky Bucket

In other words, the threshold l on the buffer for the indication of congestion The arrivals are controlled based on the queue length exceeds the threshold. The arrival cells are accommodated by the buffer.

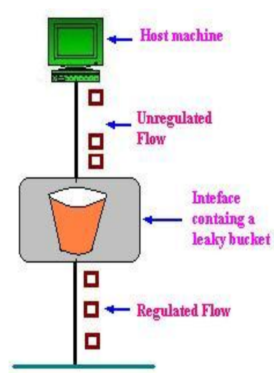

Fig 4: Leaky Bucket Implementation

In order to the arrival, the incoming packets are stored into the buffer. The counter is incremented by the credit generator and transfers each packet from the buffer when decrements it exits. To prevent simultaneous departures from different connections to the output line, there is a output FIFO queue is maintained. These are the below steps that leaky bucket algorithm is performed.

Step 1: When host injects a packet that is thrown in to the bucket.
Step 2: The bucket leaks at a constant rate (i.e), the network transmits constant delivery of packets.
Step 3: Busty traffic is converted into uniform traffic by the leaky bucket.
Step 4: In real time, the bucket having finite queue so that it can delivers finite rate.

4. SYSTEM IMPLEMENTATION

4.1 System Model

The wireless node has to be created by a graph, V is the vertex, E is the edge, TL denotes the total number of links, each link consists of transmitter node X(l) and receiver node Y(l). two nodes are one hop neighbors if they have a common link. Two links e one hop neighbor if they have a common node. Assume that a time slotted wireless system, the packet transmission occurs within time slots of unit length, here l denotes the link capacity. Interference of two links each other takes place, if they cannot transmit data at same time slot.

4.2 Joint Congestion Control

It operates on the basis of observing the rate of injection of new packets into the networks and returning rate of acknowledgements by other end. Declaring the congestion window as cnwd. When establishing a new connection with a host on another network. Initialization of congestion window segment is 1. Typically by other end segment size is announced as default (536 or 512). each time the congestion window is increased when receiving the acknowledgements, so that the sender can transmits minimum of the congestion window.
MaxWindow :: min(CongestionWindow, AdvertisedWindow)
EffectiveWindow = MaxWindow – (LastByteSent - LastByteAcked)

4.3 Scheduling Algorithm

The representation of Scheduling algorithm is the modification of Distributed scheduling algorithm. Each time slot consist of initial scheduling slots and it is further divided in to n mini slots. The links has to be selected and scheduled according to the time slots. And the selected links are transmitted the packets during rest of the time slots.

4.4 Cross Layer Control

It is fully waterfall oriented concept of the OSI communication model between the boundary layers. The approach conduct survey dynamically through the boundaries of the layer for enabling the compensation. In OSI model enforces the tight boundaries between the layers. Within a given layer, the data is tightly kept. Whereas, the cross layer approach allows that removing such tight boundaries and promotes communication between layers by allowing one layer to access the another layer data for information exchange and enables interaction. Fixed allocation of resources may results in mismatch operations of networks. Automatic repeat request (ARQ) scheme used at the MAC layer in optimizing tradeoffs and achieving maximum throughput.

4.5 Performance Analysis

Generally, evaluating the performance is entirely based on the Scheduling algorithm. The improvement of the algorithm is allowing each link if it has to involve packet transmission. The average delay of our algorithm deals with increases linearly with the hop count.

The output of the simulation variables has been considered in the simulator is Packet delivery ratio : The number of packets received at destination on data packets sent by source. Protocol overhead : it is calculated by sending number of HELLO Protocols. Average energy consumption : it deals with wastage energy while maintenance of routing and discovery. It considers the energy consumption during transmission and reception of data and control packets. Average node residual energy : considering the lifetime of the network so that it can used to evaluate the remaining energy of the node.

5. SIMULATION RESULTS

5.1 Simulation Parameters

Table 1: Simulation Parameter

Parameter	Value
Network Simulator	Ns2.29
Channel type	Wireless channel
Radio-propagation model	Two Ray Ground
Antenna type	Omni Antenna
Interface queue type	Drop Tail/PriQueue
Routing protocols	AODV/DSR
MAC type	802_11
Transmission range	50,75,100,125,150
Traffic Type	CBR
Max packet in Queue	50
Simulation Time	3ms,5ms

5.2 Throughput

It defines the number of packets arriving at the destination per second. The following graphs show the throughput provided by the two different algorithms with CBR connection with comparing the different number of nodes. The conducted simulation which results in existing work with 60 nodes at a throughput of 2.35Mbps, whereas, the proposed algorithm delivers a better throughput 5.67Mbps by delivering the data transmission in a Constant bit rate at 60 nodes.

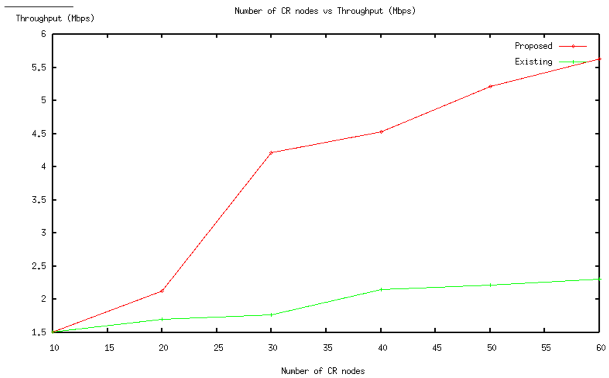

Fig 5: Throughput

5.3 Packet Loss

The Packet loss is defined using the metric that Size of the Packet with respect to the occurring of loss. In the existing work, the loss could not be controlled by initiating whatever the size of the packet, the loss occurred at a extreme high, whereas, the proposed algorithm which reduces the loss by delivering the data in the Constant bit rate and retransmission of the entire packets also been avoided. One of the notable thing is the loss increasing as well as the packet size also incremented. When compared the previous work the proposed algorithm achieves 68% of the existing works deals with 92%.

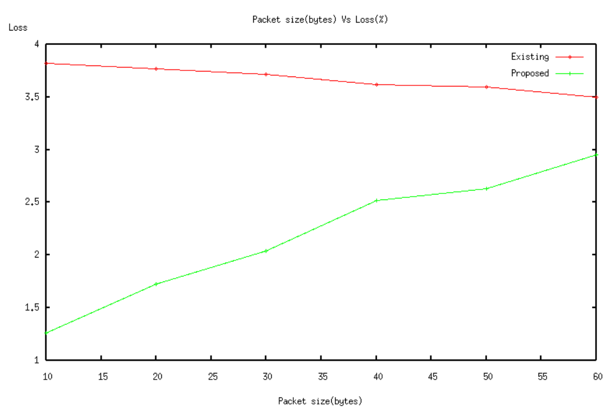

Fig 6: Packet Loss

5.4 End to End Delay

End to End Delay is defined as the input parameters based on the simulation time that which the process is simulated. By conducting these types of simulations the results would be more effective than the expectations what we have planned earlier, When comparing the existing algorithms it has been maintained upto the extreme of 82% and that has been reduced by the proposed algorithm in the way of 48% in 1.5mSec.

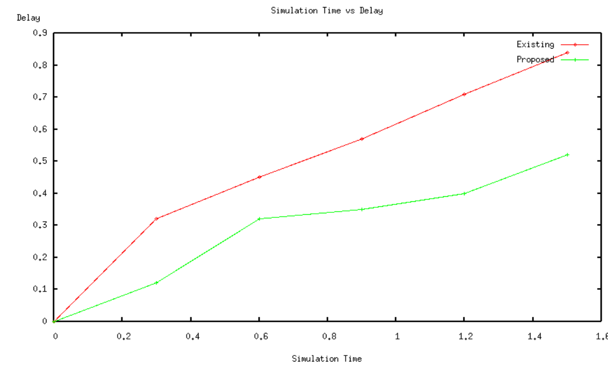

Fig 7: End to End Delay

5.5 Packet Delivery Ratio

The term Packet Delivery Ratio is calculated on the basis of simulation time during the number of Packets had been received from the number of packets has been sent. As mentioned earlier for the corresponding parameters involved in the above simulation. In the existing works narrate the ratio that achieving the 93%. In turn the Proposed algorithm achieves the precise ratio of 99.6% even though it across the 60 niodes the rate has been maintained.

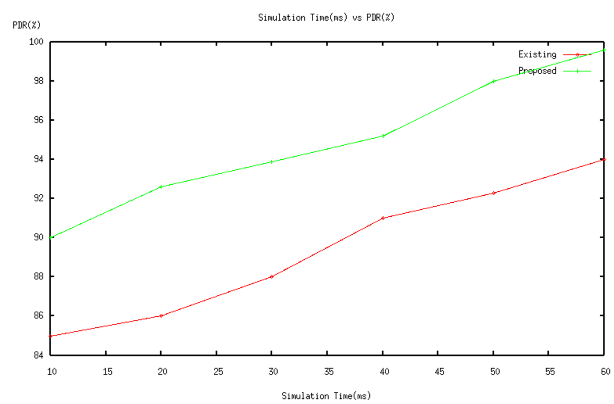

Fig 8: Packet Delivery Ratio

6. CONCLUSIONS

The transmission range as a system parameter affects the overall energy consumption of multihop wireless networks. The performance of these two algorithms shows some differences by varying transmission range and simulation time. From our experimental analysis we conclude that leaky bucket algorithm delivering maximum throughput, high packet delivery ratio, loss of packet is less and end to end delay is low compared to the existing joint congestion control and scheduling algorithm. We compare the two algorithms in the analyzed scenario, we found that overall performance of leaky bucket is better than existing algorithms at 120m range. The performance enhanced in higher transmission range. Our results can be used to determine the proper radio transmission range for the leaky bucket algorithm which guarantees the bandwidth by delivering the packets at a constant bit rate regardless of the arrival rate. The proposed leaky bucket algorithm that allows multihop wireless networks without degrading a system performance

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BIOGRAPHIES

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