

PRIORITY BASED SCHEDULING ALGORITHM USING TIME AND TRANSMISSION LENGTH IN 802.11 NETWORKS

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ABSTRACT

The fairness of IEEE 802.11 wireless networks is rigid to forecast and organize since it constructed based on uncertainty and difficulty of the MAC conflicts and dynamics. So, there is a great extent of packet data to be met in a network traffic jam and the packet data was collapsed since the nodes in the network are random. Multiple-path source routing permits data source node to dispense the entire traffic between the probable offered paths. But, in this case jamming possessions were not measured. The previous work has presented the jamming characteristics in 802.11 networks using reed Solomon code which encode and decode the packet data in the source and destination to avoid the packet data to get lost. But the jamming problem is not much considered. To improve the controllability of jamming characteristics, this paper presents a priority based scheduling algorithm using time and transmission length (PSATT) based on priority of nodes given which has minimal time and transmission length. A scheduling of the packet data to be processed is done based on priority of nodes which has minimal length and transmission length in the network environment. To reduce the network jam in 802.11 networks, a central scheduler is desired to choose how to assign the stations' requests into numerous concurrent channels. As the scheduling time is restricted, we extend a Lagrangian relaxation based scheduling algorithm for network traffic jam problem. An

experimental evaluation is done with the set of nodes in the network and shows that the proposed PSATT is better in performance in terms of scheduling time consumption, traffic allocation, average delay compared to an existing managing jamming characteristics of 802.11 networks using reed solomon codes.

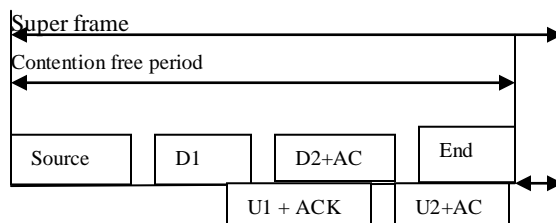
Key words: IEEE 802.11 networks, scheduling algorithm, time and transmission schedule based on priority, jamming characteristics

1. INTRODUCTION

The extensive propagation of 802.11 wireless networks creates them a gorgeous objective for a saboteur with congestion devices this creates the protection beside such attacks very serious. A jammer broadcasts electromagnetic force to obstruct genuine communications on the wireless standard. A jamming attack can act as the basis of subsequent effects in an 802.11 network: (a) Due to delivery service sensing, co-channel transmitters suspend their packet broadcasts for extended periods. (b) The jamming indication crashes with genuine packets at receivers. Frequency hopping strategies have been earlier planned for shunning jammers. Such schemes though, are not efficient in circumstances with wide-band jammers. Besides, given that 802.11 activates on moderately little frequency channels, numerous jamming devices working on diverse channels can significantly harm presentation in spite of using frequency hopping.

The impact of jammers in 802.11 networks is to achieve an in-depth capacity based tentative revise on our indoor test bed, to enumerate the collision of jamming when utilizing rate and/or power control. With rate control, a spreader can enlarge or lesser its communication rate depending on the experiential packet delivery ratio (PDR) at the receiver. With authority control, nodes may boost their communication powers and/or clear direct assessment (CCA) thresholds [10] in order to enlarge the prospect of flourishing packet reception.

In the existence of a jammer that is dynamic occasionally (and sleeps in between), the use of rate adaptation is not constantly useful. For every method, the exploit of rate adaptation may take effort in favor of the jammer. The primary access method of IEEE 802.11, called Distributed Coordination Function (DCF), is a contention-based arbitrary entrance protocol more suitable to the transfer of asynchronous traffic. In order to present support to time restricted traffic, an elective system called Point Coordination Function (PCF) is also distinct. The PCF is a sample protocol which mechanism works under the organization of the access point (AP). The AP describes an interrupted super frame collected by a Contention Free Period (CFP, where the DCF is used, as show on Figure 1. The scheduling algorithms are used with IEEE 802.11 networks. They were visualized to present a rapid improvement of data frames dishonored due to direct errors. In the lack of errors, the subsequent rules concerned for both algorithms:



D- Download data to station 1 ,
U- Uplink data from station

Fig 1 Procedure of PCF access and Access points

- The stations in the survey list are surveyed successively.
- Each station is surveyed formerly on every super frame.

Several scheduling algorithms have been presented based on time and transmission schedulers. In order to assure the QoS for IEEE 802.11e, the IEEE 802.11 assignment Group has presented a novel protocol, IEEE 802.11. In IEEE 802.11e, HCF (mixture Coordination Function) is deprived of which used DCF (Distributed Coordination Function) and PCF (Point Coordination Function) in 802.11. HCF is collected of EDCA (Enhanced Distributed Channel Access) which reins the guide admitted in argument period and HCCA (HCF Controlled Channel Access) which reins the control access in non-contention period. In this work, the jamming characteristics are controlled by presenting a priority based scheduling algorithm using time and transmission length in 802.11 networks.

2. LITERATURE REVIEW

In current years, the wireless 802.11 networks have been extensively organized in enterprises, public areas and habitat situation. Since of its completion ease and low protection cost, wireless LAN is suitable for a very appropriate connection. For 802.11 networks, an anti jamming system is formed [1] with a measurement of anti-jamming systems. Several techniques have been presented by many authors to identify the performance evaluation [2] of the wireless IEEE 802.16 Based Wireless Mesh Networks.

Several algorithms also been presented for 802.11 networks. For a cross layer downlink evaluation, [3] presented an enhanced cross layer downlink scheduling algorithm. For an uplink traffic control in 802.11 networks, a predictive scheduling algorithm [4] developed. There are some guidelines have also been developed for 802.11 WLAN Design [5]. The architecture diagram of the proposed IEEE 802.11 networks are mentioned in fig 1 which has

some access points [6] for facilitating the network jamming characteristics. There is a great possibility of multi-path routing architecture [7] by maintaining a high throughput rate into the network.

To maintain the jamming characteristics, several techniques have been used for improving the intelligent characteristics of 802.11b and other networks [8] and the rate adaptation control [9] is also being controlled over Urban and Vehicular Environment. The implementation and experimental evaluation is done with the cross layer with Collision-Aware Rate Adaptation [10] and the defense strategies are also be explored [11]. In this work, priority based scheduling algorithm using time and transmission length in 802.11 networks is briefly described in section 3.

3. PRIORITY BASED SCHEDULING ALGORITHM USING TIME AND TRANSMISSION LENGTH IN 802.11 NETWORKS

The proposed work efficiently controlled the jamming characteristics using priority based scheduling algorithms using time and transmission length in 802.11 networks. The proposed priority based scheduling algorithm using time and transmission length in 802.11 networks operated based on two operations. The first operation is to identify the jamming characteristics and the number of resource utilization for jamming is identified and localized. The second operation is to apply the proposed priority based scheduling algorithm which could be accessed based on identifying the time and transmission length of 802.11 network environment.

The first operation is to identify the jamming characteristics of 802.11 networks. The characteristics of jamming traffic are considered. The collision of resource utilization on jamming traffic is also recognized. The data source node for most favorable multi-path traffic allocation is considered and localized. The utilization of scheduled

resource enhances the data release rate of the source nodes.

The second operation describes the process of priority based scheduling algorithm based on time and transmission schedule in 802.11 networks. The transmission schedule of the packet data is to be done based on priority and the jamming characteristics also be controlled. The architecture diagram describes the process of the proposed PSATT shown in fig 3.1.

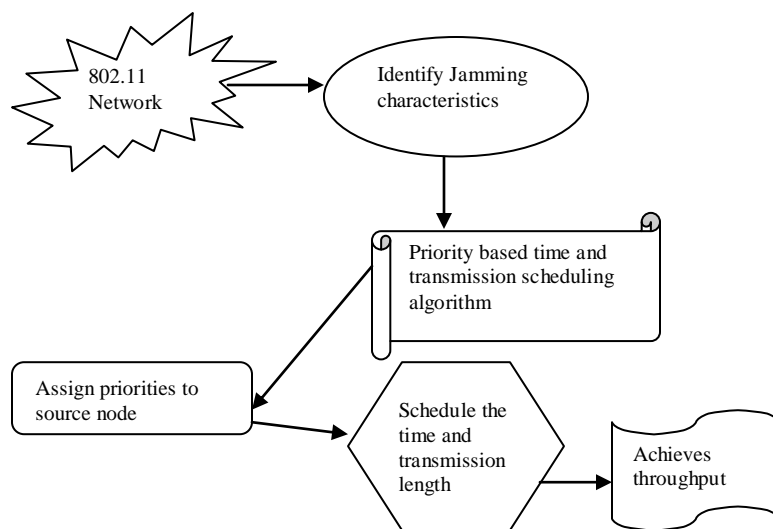


Fig 3.1 Architecture diagram of the proposed PSATT

The above figure (fig 3.1) describes the entire process of the proposed PSATT using the impact of network traffic allocation. The outcome of the proposed PSATT is to make the allocation in an intelligent manner with better throughput rate.

3.1 Identification of jamming characteristics

The jamming model must be precise adequate to confine the individuality of practical jammers, and, at the similar time, be easy sufficient for the optimization of network protocols. It has been standard that the power supply is the most significant restriction for the mainstream of practical jammers. A typical jammer is motorized by a battery, which can be

re-energized from an exterior source, such as a solar cell array. The source node decides its own transfer allocation with the assist of minimum message passing among sources. The purpose of the jammer is to interrupt the ordinary operation of the transmit system, which results in high waiting time and unnecessary power consumption of the clients. To that end, the jammer sends active signals over the channel that interfere with the signal sent by the server. A set of sources with expected parameters recompense on the existence of jamming on network traffic stream in dispersed formulation for jamming-aware traffic allocation.

3.2 Priority based scheduling algorithm using time and transmission schedule

The proposed priority based scheduling algorithm is done by assigning the priority level to each data source node based on its packet size. After identifying the packet size, classify the data source node based on its packet size priority. After classification, the time and transmission schedule is allotted to each set of source node in 802.11 network environment.

For a given n nodes, where each of them send a request for an average real-time data rate of r_i^R (in bits/frame) and the lowest non-real-time data rate of r_i^N (in bits/frame), and utilizes a channel rate of $c_{i,k}$ (in bits/slot) at frame k . The scheduling problem establishes the resource $a_{i,k}$ (in bits) allocated to each nodes in every frame k , such that the network throughput is maximized and the delays of real-time traffics are assured. The process of the proposed PSATT is shown in fig 3.2.

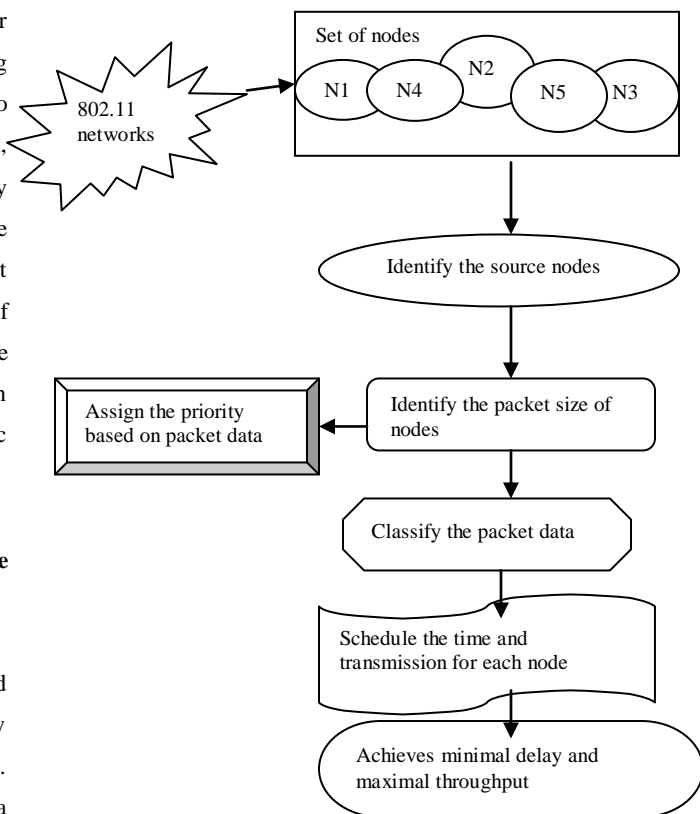


Fig 3.2 Process of the proposed PSATT

A set of nodes in the 802.11 networks are identified and the source nodes are ready to transfer the set of packet data to be transferred from source to destination. The packet size of each node is identified and the priority is assigned to the nodes which has small packet size and classify it according to the packet size of each source nodes. After assigning the priority of nodes in the network environment, schedule the time and transmission length to each node. The algorithm below describes the process of the proposed priority based scheduling algorithm using time and transmission length in 802.11 networks.

The algorithm below describes the process of the Time and Transmission Scheduling algorithm based on priority scheduling is shown below.

Input: Packets P, packet size PS, Transmission T, time t, Schedule S

Output: Transmission schedule S

Step 1: For each node N

Step 2: Identify the packet size PS

Step 3: Identify the time slot t of each packet arrives at network

Step 4: End For

Step 5: Based on packet size PS and resource consumption RC,

Step 6: Assign the priority p

Step 8: i.e., Nodes which requires minimal PS and RC assigned as first priority

Step 9: Maintain the hierarchy pf nodes based on packet size

Step 10: Identify the set of transmissions T that are ready to slot at time t

Step 11: For each Transmission

Step 12: Assign a minimal waiting time min (T_w) and expected waiting time min (ET_w)

Step 13: Calculate Waiting Time

$$T_w(S) = t' - t \dots\dots\dots (\text{eqn 1})$$

Where S be a broadcast schedule

t be the client's request was placed

t' be the client receives a message at a

time t

Step 14: Calculate Expected Waiting Time

$$ET_w(S) = \lim_{w \rightarrow \infty} \frac{1}{w} \int_0^w \text{WaitingTime}(S) dw$$

..... (eqn 2)

Step 15: Calculate Staleness data to

Identify the amount of time that passes from the moment the information is

Generated

$$\text{Staleness}(S) = t_k - t$$

..... (eqn 3)

Where t is the time the clients' request has been placed

K be the number of the packet

data at present over the channel

Step 16: Until the client receives the delivery message

Step 17: End For

Step 18: If ($\min(T_w) > T_w$)

Step 19: Compute the transmission with low T_w

Step 20: End If

Step 21: If P does not deliver to the destination at time t

Step 22: Return the packet to source node

Step 23: $ch = ch + 1$

Step 24: $S = \text{low } T_w$

Step 25: End If

Step 26: End

Step 27: $t \leftarrow t + 1$

Step 28: End

The above algorithm describes the process of scheduling the transmission time of the nodes in the network. Several nodes were present in the 802.11 network. For each node, it is necessary to identify the packet size and consumption of resources to process the packet data. After identification, the priority has been assigned to the nodes which have minimal packet size and resource consumption. Those nodes are given to priority to transmit the packet data. After assigning the priority status, the nodes' incoming and waiting time are noted for scheduling the transmission length and time in the network. Based on the waiting time, transmission time, the schedules are properly given to the nodes for an efficient traffic allocation in 802.11 network.

4. EXPERIMENTAL EVALUATION

The proposed priority based scheduling algorithm using time and transmission length in 802.11 networks has been designed efficiently for managing the jamming characteristics of 802.11 networks using NS2 simulator. Initially the experiment is evaluated with 100 nodes in a flat area of $100 * 100 \text{ m}^2$. The nodes' incoming time (sec) is noted as t_1, t_2, \dots, t_n . The routing discovery mechanism is taken over by BGP routing information for

identifying the route path from source to destination. The transmission time and the priorities are assigned to the packet data using the algorithm described under section 3.2. The simulation results show that it takes 800 secs to transmit the packet from source to destination by choosing the path efficiently and managed the network traffic jam using the priority based scheduling process using time and transmission length of the data source packet from source to destination in 802.11 networks. The performance of the proposed priority based scheduling algorithm using time and transmission length in 802.11 networks are evaluated in terms of

- i) Scheduling time consumption,
- ii) Traffic allocation,
- iii) Average delay

Transmission Scheduling time is the time taken to schedule the given packet data to transmit on the route to reach the destination at a given particular interval of time.

Traffic allocation: Transmission schedule is measured as percentage of cases the algorithm is able to find a feasible schedule among the total number of cases considered. The maximum number of traffic allocated at a field device at any point of time during the schedule.

Average delay is the delay time taken to transmit the data from source to destination.

5. RESULTS AND DISCUSSION

When compared to an existing jamming characteristics is done by using Reed Solomon codes (MJRSC), the proposed priority based scheduling algorithm using time and transmission length in 802.11 networks performed better in terms of transmission scheduling time, traffic allocation and average delay. The proposed priority based scheduling algorithm using time and transmission length in 802.11 networks efficiently done the transmission schedule based on the priority. Since the priority has given based on PS and RC, the transmission is

scheduled to the destination and hence the network traffic jam will become less. The below table and graph describes the performance of the proposed priority based scheduling algorithm using time and transmission length in 802.11 networks.

No. of packet data	Transmission scheduling time (ms)	
	Proposed PSATT	Existing MJRSC
10	5.2	12.5
20	9.7	18.8
30	13.3	24.3
40	17.6	29.1
50	19.4	32.8

Table 5.1 No. of packet data vs. transmission scheduling time

The above table (table 5.1) described the transmission scheduling process and the results of the proposed PPATT are compared with an existing MJRSC based on number of packets data in the network increases.

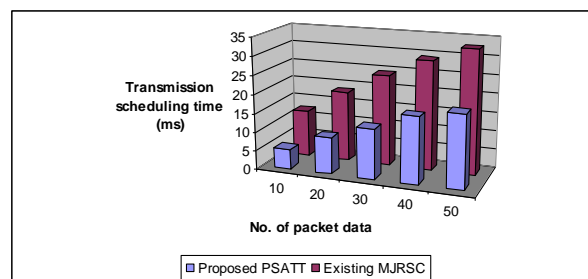


Fig 5.1 No. of packet data vs. transmission scheduling time

Figure 5.1 depicts the resultant graph of transmission scheduling time on proposed priority based scheduling algorithm using time and transmission length in 802.11 networks and Existing MJRSC. For every simulation packet data can be increased from 10, 20.... 50. Transmission schedule is noted for each simulation. If number of packet data in the network increased, Transmission scheduling time gets routinely decreased in the proposed priority based scheduling algorithm using time and transmission length in 802.11 networks since it schedules based on the priority value. The transmission scheduling time is measured in terms of milliseconds (ms). The above performance graph shows the proposed priority based

scheduling algorithm using time and transmission length in 802.11 networks outperforms 85% well compared with an existing MJRSC.

No. of nodes	Traffic allocation (%)	
	Proposed PSATT	Existing MJRSC
100	80	45
200	95	68
300	105	54
400	97	72
500	99	59

Table 5.2 No. of nodes vs. Traffic allocation

The above table (table 5.2) described the efficiency of traffic allocation process and the results of the proposed PPATT are compared with an existing MJRSC based on number of nodes in the network increases.

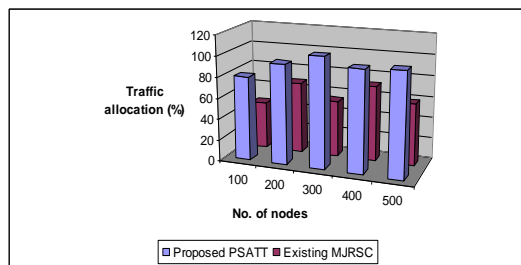


Fig 5.2 No. of nodes vs. Traffic allocation

Figure 5.2 depicts the resultant graph of efficient traffic allocation on proposed priority based scheduling algorithm using time and transmission length in 802.11 networks and Existing MJRSC. For every simulation nodes can be changed from 100,200.... 500. Traffic allocation ratio is measured for each simulation. If number of nodes is increased, Traffic allocation ratio gets routinely decreased in both proposed priority based scheduling algorithm using time and transmission length in 802.11 networks and Existing MJRSC. For example, In Proposed priority based scheduling algorithm using time and transmission length in 802.11 networks, nodes from 100 to 500, Traffic allocation ratio is 90 to 96 % and traffic allocation ratios gets reduced to 85%. The

above performance graph shows the proposed priority based scheduling algorithm using time and transmission length in 802.11 networks outperforms well compared with existing MJRSC.

No. of nodes	Average delay (ms)	
	Proposed PSATT	Existing MJRSC
100	11.2	18.6
200	15.6	24.8
300	22.4	35.2
400	19.7	29.6
500	21.3	33.4

Table 5.3 No. of nodes vs. Average delay

The above table (table 5.3) described the average delay taken to transmit the packet data and the results of the proposed PPATT are compared with an existing MJRSC based on number of nodes in the network increases.

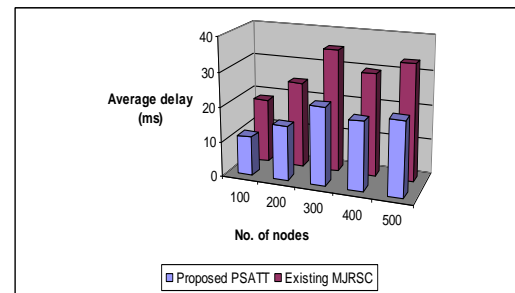


Fig 5.3 No. of nodes vs. Average delay

Figure 5.3 depicts the resultant graph of average delay time on proposed priority based scheduling algorithm using time and transmission length in 802.11 networks and Existing MJRSC. For every simulation nodes can be increased from 100, 200.... 500. Transmission schedule and the average delay time is also being noted for each simulation. If number of nodes in the network increased, average delay time gets routinely decreased in the proposed priority based scheduling algorithm using time and transmission length in 802.11 networks since it schedules based on the priority value. The average delay time is measured in terms of milliseconds (ms). The above performance graph shows the proposed priority based scheduling

algorithm using time and transmission length in 802.11 networks outperforms 80% well compared with an existing MJRSC.

From the experimental results, it is observed that the proposed PSATT achieves well in traffic allocation process. Since the proposed PSATT used priority based scheduling, the transmission schedule is done in a less interval of time, so the average delay is also being decreased.

6. CONCLUSION

In this paper, we have implemented a priority based scheduling algorithm using time and transmission length for wireless 802.11 networks in presence of jamming. Proposed priority based scheduling algorithm using time and transmission length provides low waiting time and delay time. Schedules were optimal since it used priority levels using time and transmission length even jamming signal has energy restrictions. Priority based scheduling is efficiently done based on the arrival time, waiting time and transmission time of the nodes in the network that allow schedule to minimize waiting time of the clients and staleness of the received data. Experimental simulations were conducted to evaluate the performance of the proposed priority based scheduling algorithm using time and transmission length for wireless 802.11 networks. Simulation results show that the proposed priority based scheduling algorithm using time and transmission length for wireless 802.11 networks performs well compared to an existing MJRSC.

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