Artificial Bee Colony Optimize Multi Queue Buffer Allocation for TCP Flow in WLAN

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Abstract- The important concern in Wireless Local area network is allocation of resources because all wireless nodes battle for same channel of radio. When uplink and downlink transmission congestion protocol (TCP) flows exist together in WLAN, then the service of network is biased towards uplink and it makes downlink TCP flows suffers. In this paper, artificial bee colony base optimization for dynamic allocation of buffer by adaptive threshold and analysis throughput, drop packet and other parameters

Keywords- Wlan, congestion, optimization, ABC

I. INTRODUCTION

There has been an explosive growth in the use of IEEE 802.11 Wireless LANs to support networking applications (e.g. web, email, media downloads, etc.) ranging from web-browsing and file-sharing to voice calls [1, 2]. For audio and video on demand, jitter is the main problem, which can be smooth out by buffering without affecting reliability or bandwidth. Buffering also helps in reduction of congestion, another much more critical problem[3,4].Buffering is used to slow start, congestion avoidance, fast retransmit, fast recovery with modifications and to accommodate short-term packet bursts so as to mitigate packet drops and to maintain high link efficiency [5].

In the case of wireless networks, transmissions are inherently broadcast in nature, which leads to the variable mean service time, which is strongly dependent on the offered load. This directly affects the bustiness of transmissions and hence buffering requirements. Secondly, wireless stations dynamically adjust the physical transmission rate/modulation used in order to regulate non-congestive channel losses. This rate adaptation may induce large and rapid variations in required buffer sizes. Thirdly, the IEEE 802.11n standard improves throughput efficiency by the use of large frames formed by aggregation of multiple packets. This acts to couple throughput efficiency and bufferssizing in a new way since the latter directly affects the availability of sufficient packets for aggregation into large frames[5].

Buffer Size: Packet buffering is reduced the frequency of packet drops and, especially with TCP traffic, they can avoid under-utilization when TCP connections back off due to packet losses. At the same time, though, buffers introduce delay and jitter, and they increase the router cost and power dissipation[6]. The TCP configuration supported buffers (TCP receive window size) of up to 65,535bytes, which was adequate for slow links or links with small round trip times (RTTs)[7]. Using large buffers can lead to high queuing delays, and to ensure low delays, the buffer should be as small as possible. Therefore, when the buffer size becomes very small the connection throughput becomes very chaotic. The IEEE 802.11 WLANs are operated with the smallest buffer size that ensures sufficiently high link utilization[5].

TCP Challenges in Wireless Ad Hoc Networks:

TCP has proved to perform reliably in traditional wired and stationary networks were the main reason for losses in network congestion but it does not perform as so when applied to wireless networks. It is because of the misinterpretation of the losses that are not caused by network congestion. Unfortunately, it invokes a congestion control algorithm which reduces the bandwidth utilization and becomes the reason for performance degradation by providing poor throughput and higher delays[8]. The major reasons behindthroughput degradation [9] that TCP faces when itused in wireless ad hoc networks are the following:Misinterpretation of packet loss

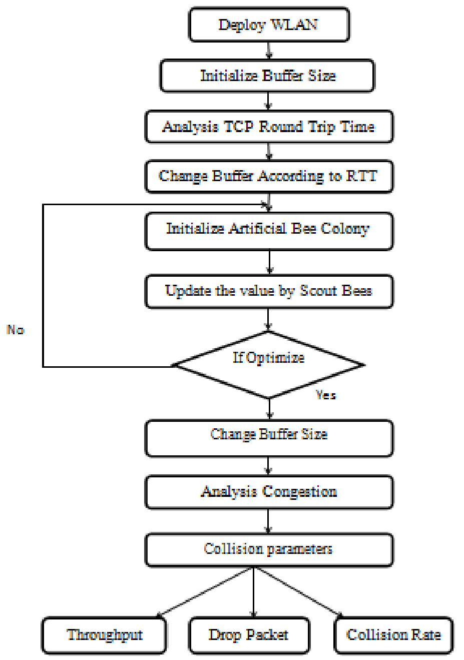
- Frequent path breaks
- Effect of path length
- Misinterpretation of the congestion window
- Asymmetric link behavior
- Uni-directional path
- Multipath routing
- Network partitioning and emerging
- The use of the sliding-window-based transmission

II. LITERATURE REVIEW

I. S.Leandro et al 2016 [10]Analysed the state-of-the-art in real time and priority pre-emptive wormhole networks also proposed a novel analysis that extends the state-of-art by carefully modeling the effects of buffering on indirect interference. The work aimed to capture the multiple interference problem caused by downstream interference identified in. Didactic examples and large scale experiments with synthetically generated packet flow sets provide evidence of the strength of the proposed approach. **T.K. Akienel et al 2015 [11]** Optimization of data packet transmission is research work that examines the various protocols involved in the transmission of data/packet from source to destination or sink and uses the modified FIFO Queue system to manage the problem of packet loss during transmission in a congested network. Further prototyping methodology software developed which control and eliminates the data loss during transmission in the congested network. **B. Subramani et al 2014 [12]** Presented a survey on current trends and advancements of Area of TCP-friendly congestion control, further discussed the necessity for TCP-friendly congestion control for both non-TCP based unicast traffic overview of the design space for such congestion control mechanisms. Various congestion control algorithms are available but it seems that at present there is no single algorithm that can resolve all of the congestion problems on networks and the internet. **R. Saranya 2014 [13]** Distributed and scalable technique that eliminates congestion inside wireless sensor network which will provide safe transport to packets to their destination or central station. We say that fairness is achieved after equal numbers of packets consented from each node. In the end, there were countless Sensors transmitting data to the central station. Hop-by-hop upstream congestion control protocol for WSN shouted PCCP. Congestion manipulation protocols cut packet defeat due to a bufferoverflow and lower manipulation overhead that consumes less energy. **C. Socrates et al2014 [14]** Focused on the study of congestion control and elaborated various issues. Congestion control is the most important factor of any packet switching network, the whole performance and accuracy of the networkdepend on it, further concentrates on avoidance of congestion. This scheme allows a network to operate in the region of low delay and high throughput. **K. Ittipong 2014 [15]** Evaluate ESRT in two contexts. Firstly each of its algorithm associated with five different characteristic regions is analyzed based upon power preservation and convergence to the optimal operating state. Secondly, ESRT is evaluated on its generality to fit in WSNs applications. ESRT was specially designed for an event-based application which does not require complete reliability. Data transmission and recovery are not included in ESRT. Total of five algorithms has been proposed for corresponding network operating regions. **M.A. Raheem et al 2014 [16]** Proposed a GSM congestion prediction model based multilayer perceptron neural network(MLP-NNs) with sigmoid activation function and levenberg-Marquardt Algorithms(LMA) using real traffic data. The trained network model was used to predict traffic congestion along a chosen route. The trained network was simulated with new input data and results shown that the behavior of the developed model is very close to real network situation. With the availability of relevant historical traffic data, an artificial neural network can model the behavior of a mobile network to predict the occurrence of n/w irregularities. **K.P. Vijay et al 2014[17]** Proposed and investigate a new congestion avoidance mechanism coupled with the authenticated mode of data transfer. This congestion avoidance mechanism givesfeedback between routers at borders of a network in order to detect and restrict unresponsive traffic flows before they enter the network and to transmit the data securely by employing a cryptographic technique. It helps to audit packets that are received or send in a local area network and ensured data security by applying cryptographic methods. **U. Saleem et al 2014 [18]** Proposed a scheme that improving the network efficiency by making the modification in congestion control constraints. The congestion in the network not only causes severe information loss but also degrades overall network performance. Further proposed and investigate the mechanism for congestion control by selecting appropriate congestion window size and proactive avoidance which improves system overall performance and efficiency. **M. Brahma et al 2006 [19]** Proposed a new scheduling scheme to provide priorities overflows of traffic in order to support QoS in wireless IEEE 802.11b. This scheme is based on multiple queues and dynamic weights for each queue. Further, analyze the performance of the scheme and compare its performance with the original IEEE 802.11 standard.

III. Proposed Flowchart:

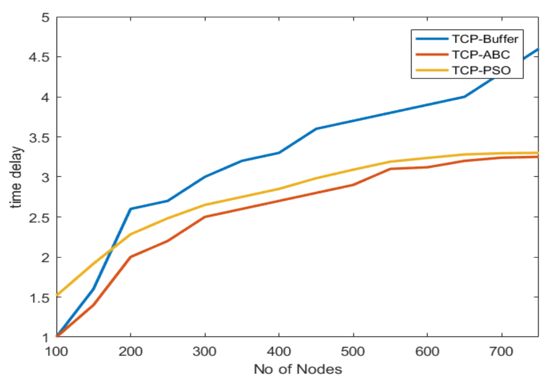
1. The first step is deploying the WLAN network.
2. Then start initializing buffer size.
3. Analyze the TCP Round Trip Time and Change the buffer according to Round Trip Time.
4. As the RTT is set then initialize the Artificial Bee Colony.
5. After initialization, update the values of Scout Bees.
6. Now start the optimization process, if optimization is done then start the further process otherwise go to Step 4.
7. As the optimization is done then change the buffer size and start analyzing Congestion.
8. Analyze the Collision parameters i.e., Throughput, Data Packet, and Collision Rate.



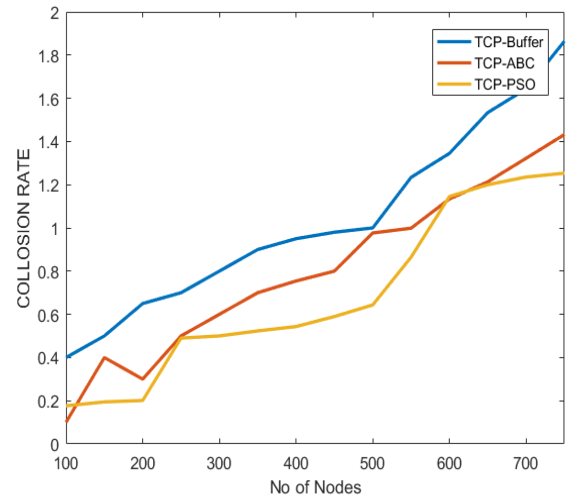
Flowchart 1: Optimization with ABC Approach For multiple Buffer

III. RESULTS AND ANALYSIS

Graph 1 shows the time delay performance of Multiple buffers with or without optimization. Time delay is minimum in TCP-ABC and maximum in TCP-Buffer. In all the three techniques, the time delay is increasing as the number of nodes is increasing. In the case of TCP-PSO, the value of time delay shows continue to increment and on the other hands, in the other two techniques time delay shows zigzag pattern somewhere increasing or somewhere decreasing.

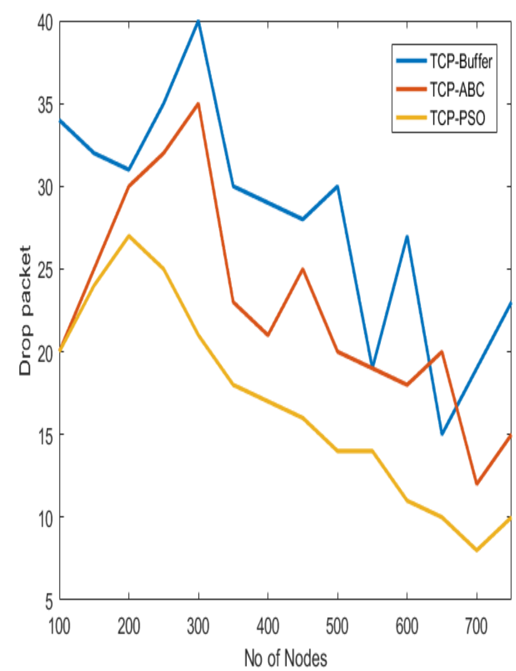


Graph1: Multiple Buffer time delay performance with or without optimization



Graph 2: Multiple Buffer Collision Rate performance with or without optimization

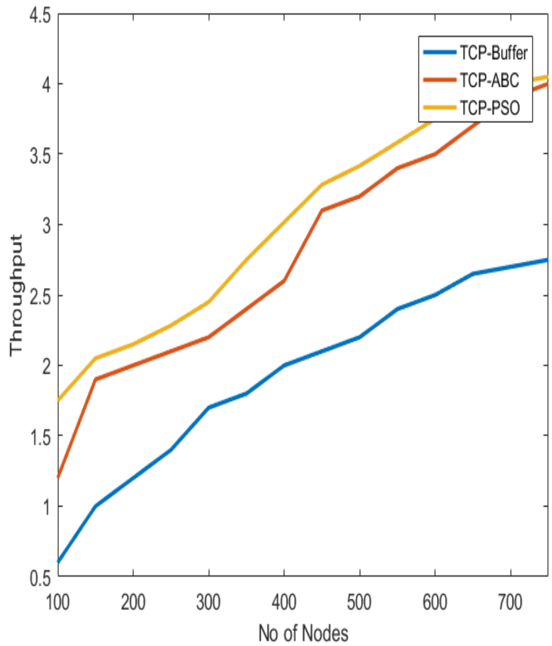
Graph 2 presents the Collision Rate performance of Multiple Buffer with or without Optimization. The collision rate is increasing with the increase in the number of nodes. TCP-PSO has least collision rate and TCP- Buffer has a maximum collision rate.



Graph 3: Multiple Buffer Drop Packet performance with or without optimization

Graph 3 depicts the Drop Packet Performance of Multiple Buffer with or without optimization. The Drop packet rate is decreasing as the number of nodes is increasing. Least packet is seen in the case of TCP-PSO and the highest is in the case of TCP-Buffer.

Graph 4 represents the Throughput Performance of Multiple Buffer with or without optimization. Throughput is increasing as the number of nodes is increasing. Throughput is maximum in TCP-PSO and vice-versa in the case of TCP-Buffer.



Graph 4: Multiple Buffer Throughput performance with or without optimization

IV. CONCLUSION

This paper presents the Bayesian approximation buffer allocation control system for IEEE 802.11b wireless local area networks (WLANs). It develop different weighted queuing (WQ) method, which assumes changes on the coefficients of weight with optimal buffer for adaptive flow control. The scheduling of traffic flows is done to overcome the traffic level. The algorithm regulates the amount of throughput and packet drop rate allowed by bandwidth for each service class in the outputs of wireless router anticipating the application dependent delay and packet loss rate. Simulations shows that the developed WQ model using Bayesian approach is more balanced and responds faster to different states of traffic. Artificial bee colony queuing (BAQ) used in TCP improves the performance of collision rate and reduce congestion.

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