

## Improving Throughput for all Access Points in Distributed Uncertain Environment by Applying TDMA-CSMA

*Mrs. S. Pavithra and Mr. P. Rajapandi*

Department of Computer Science and Engineering,  
SBM College of Engineering and Technology, Dindigul, India

**Abstract:** In Wireless networks, the number of users and the networks are connected through Access Points (APs). The numbers of users are distributed randomly and uncertainly. So, providing a regular amount of throughput by the APs to all the users asynchronously connected is essential nowadays. In the existing approach Carrier Sense Multiple Access (CSMA) based throughput guarantee is applied. Where CSMA guarantee the minimum amount of throughput to all the APs is not sufficient for the APs which connected with more users dynamically. This paper is aimed to overcome these issues and provide an efficient throughput guarantee to all the APs according to their requirement. For this, Time Division Multiple Access (TDMA)-CSMA based throughput allocation is provided. TDMA can compute the requirement of the communication and provide throughput repeatedly within a time interval. TDMA utilizes scheduling and round robin method for improving the efficiency of the throughput allocation. Provisioning of an optimal throughput is sufficient for the APs which communicate with more number of users and the starvation can be avoided in the distributed uncertain environment. The simulation of this AP based throughput improvement is carried out in NS2 simulator software and the performance is analyzed by comparing with the existing approaches.

**Key words:** Wireless Network • Access Point • Throughput Maximization • CSMA • TDMA • IEEE-802.11 standard

### INTRODUCTION

In wireless network, the numeral of Wi-Fi access points (APs) has dramatically increased in both residential areas and commercial areas. Such APs are typically deployed independently by individuals, network service providers and enterprises and are operated in an awkward manner. As a result, they can significantly interfere with each other, resulting in performance degradation. Thus, there has been increasing concern about inter-AP interference or contention, especially in asymmetric contention scenarios where some APs can starve. In this paper, they study how to guarantee fairness among APs that are densely deployed. Asymmetric contention among APs in an uncoordinated resource sharing environment can guide to a grave erroneous problem. Regrettably, such asymmetric contention scenarios are quite common in real-world AP deployments. There is numeral of identification in the background of inter-AP interference mitigation. However, most of the previous works focus

only on interference mitigation and can still experience AP starvation as merely achieving interference mitigation does not guarantee inter-AP fairness.

An uncomplicated loom to addressing the AP malnourishment problem is to schedule users in a way that the collective throughput of each AP meets a certain equality standard. However, such a loom requires a massive amount of computations as well as a central manager that can check the entire network. In this paper, they develop a new practical structure for inter-AP justice assurance. The structure provisions a certain quantity of throughput to every AP so that no AP starves yet in asymmetric argument scenarios. Thereafter, the provisioned throughput of each AP is sure fire via a dispersed CSMA. Clearly, the possibility of provisioned throughput depends on AP-level intrusion relationship. For occasion, if an AP experiences brutal intrusion from other APs, then its provisioned throughput could be infeasible, implication that it cannot be achieved by the AP. Thus, the AP-level intrusion relationship should be

taken into account when provisioning the throughput of each AP. The challenge here is that the interference relationship among APs is determined by not only the detachment between APs, but also the allotment of users that has uncertainty due to dynamic arrival and departure. For instance, two APs will impede more ruthlessly when many of their associated users are in the common coverage area than otherwise.

This manner is known to display both short and extended term grievance. That is the MAC layer in DCF mode may fail to provide reasonable provision of channel resources to competing stations, which has harmful result on real time applications. Numerous schemes have been projected in the prose to conquer these shortcomings of the DCF mode. Most of these schemes propose one or a grouping of the subsequent techniques; modifying the DCF pull back apparatus employing adaptive size for disputation window using dissimilar inter frame spacing or various frame sizes. Here, a network access point occasionally initiates disputation free periods in which it polls its related stations. Contrasting the DCF mode, the PCF is a federal access method and it is suitable for sustaining RT traffic. The “connection-oriented” performance of the PCF mode allows the network to suggest bandwidth and delay guarantees that are necessary to support RT applications. If the users are in the transmission range of the access point. The “connection-oriented” actions of the PCF method allow the network to deliver bandwidth and remain guarantees that are compulsory to sustain RT applications. If the users are in the transmission series of the access point. However, this asset is not continued in networks with several access points that have overlapping diffusion ranges or cells. In such networks communication collisions may happen at some point in a CFP as a upshot of also “buried nodes” that have not predictable the beacon post announcing the establishment of a CFP, the so-called concealed node crisis, or when two contiguous access points schema their CFPs alongside, known as the overlapping cell trouble.

**Related Work:** There are several papers that study user level fairness in 802.11 based wireless adhoc networks [1]. A simple starvation classification instrument will determines the sources of malnourishment via confined dimension. They mainly focus on flow starvation scenario due to badly configured system parameters. In adding together they focus on well-known sources of starvation such as carrier sense malnourishment, hidden node starvation and identify a third cause of starvation, i.e., random intelligence malnourishment. Localized solutions

are enviable in allowing incremental advance of WLAN access points (APs) and client campaign. They show the flow malnourishment which can be mitigated by tuning the system parameters individually of the wireless machines [2].

A QoS (Quality of Service) provisioning structure that deals with inter-cell level separation as well as inter-flow level precedence, which may be viewed as expansion of QoS provisioning from a single WLAN domain to a multi WLAN domain. The heart of their QoS structure has the ability of inter-BSS discrimination and it allows the system to regulate the inter-cell direct conflict. They also suggest the structural design for organization of multi-AP systems. In which, a middle manager arbitrates the wireless channel tenancy of APs by adaptively configuring the cell-level QoS Parameters [3].

There has been enormous effort to mitigate inter access point interference, power control [4-6] and centralized scheduling [7], including channel assignment [8,9]. An Adaptive carrier sense multiple access scheduling algorithm that can attain the maximal throughput distributive. The algorithm is pooled with jamming which can manage to get the most favorable value and sprite of challenging flows. Also, the adaptive CSMA scheduling is a modular MAC-layer algorithm that can be pooled with a variety of practices in transfer layer and also in network layer [10].

A simplification of algorithm for continuous-time model, a evidence is offered for the junction of these adaptive CSMA algorithms which is randomly close to value optimality, without pretentious, then the network dynamics congeal, while the CSMA parameters are restructured. They turn to more practical discrete-time controversy and back off representation and enumerate the outcome of collisions. They expose and distinguish the exchange between long-term competence and short-term justice. In, slotted-time model, the crash of collisions on the worth complete is separated [11].

A discrete time ranges in queue-length based CSMA/CA procedure that leads to collision-free data transmission. The discrete-time formulation allows to integrate the mechanisms which is used to radically reduce the impediment without upsetting the academic throughput-optimality assets. In particular, combining CSMA with distributed GMS (Greedy Maximal Scheduling) leads to extremely high-quality impediment presentation. They differentiate the tradeoff between long-term competence and short-term justice. In practical, slotted-time replica, has an exchange between optimality at short-term justice is quantified [12].

A simple Back of Envelope approach for computing throughput distributions among links in a CSMA network. For 802.11 networks, this fast computation method has been verified to be very accurate [13]. The existence of fair end-to-end window-based congestion control protocols for packet-switched networks with FCFS routers and definition of fairness generalizes proportional fairness and includes arbitrarily close approximations of max-min fairness. The protocols use only information that is available to end hosts and are designed to converge reasonably fast [14]. An optimal control for general networks with both wireless and wired line components and time varying channels. A dynamic strategy is developed to support all traffic whenever possible and to make optimally fair decisions about which data to serve when inputs exceed network capacity [15].

**Existing Work:** In the existing studies an amount of guaranteed throughput is provided to each AP via CSMA technique. It introduced a new conception of AP-level throughput provisioning for inter-AP fairness guarantee. It was aimed to develop a random conflict-graph-based interference model that can deal with the uncertainty of user distributions. In the existing system it is developed a narrative two-step advance that: 1) computes a vigorous possible minimum AP throughput distribution under user division uncertainty; and 2) fulfills the minimum obligation via a dispersed CSMA algorithm. It is implementing the CSMA algorithm onto the practical IEEE 802.11 proposal by mounting a back off-time and holding-time scheme companionable with the IEEE 802.11 standard.

**Prospect Inhibited Formulation:** The operator spreading regulates to the entire interfering association amid AP's whose positions are assumed. They explain for the ambiguity of operator dissemination by exhibiting inter AP intervention as an accidental *skirmish graph*, in which an apex characterizes an AP and describes the possibility that there is a brink between any two apexes. Hence, a brink exists between apexes and with possibility. They accept that the actuality of each brink in is self-governing of alternative. The survival of a brink between two apexes designates that the equivalent two APs inhibit with each other and therefore the inter AP intervention possibility. Thus, the ambiguity of operator dissemination is arrested in the possibility. The possibility can be calculated by using numerous user dissemination tasters. For a skirmish graph, occupancy is the set of self-governing groups. Then, the possible set of AP throughput courses a dimensional double route

demonstrating an IS. If AP is in IS 1 and 0 otherwise. The value is the portion of time that is triggered. Obviously, the customary is arched. One way to assurance the probability of smallest throughput route is to identify and practice such that for little possibility.

#### **AP Throughput Provisioning Problem [P-ATP]:**

The heaviness of AP and is a trivial expectant quantity less than 1. It necessitates that the calculated smallest route is possible with likelihood at least. If is nothing, then the smallest throughput route residues possible for all probable situations (or consistently every), but it might be too traditional. On the conflicting, if is big, then the smallest route can be amplified, but its possibility would be incomplete to a minor amount of situations. Hence, by altering the price. They can controller the traditionalism and forcefulness. APs inquisitive with few APs are allocated higher smallest throughput than APs inquisitive with numerous APs. This realizes a judicious negotiation between justice and competence. However, if they famine to facility extra throughputs to AP, they can allocate advanced.

**Solving APT Problem:** The AP-level intrusion relationship should be taken into account when provisioning the throughput of each AP. The challenge here is that the interference relationship among APs is determined by not only the detachment between APs, but also the allotment of users that has uncertainty due to dynamic arrival and departure. For instance, two APs will impede more ruthlessly when many of their associated users are in the common coverage area than otherwise.

**Limitations of the Existing Systems:** In general AP which communicate with less numbers users need less throughput provision and each AP which communicate with more number of users need more throughput provision. But in, distributing a minimal throughput is not sufficient for the AP which communicates with more number of users. Also the existing system distributes the minimal throughput with the help of CSMA. Also Content slot allocation should not be overheard and not exceed more than the necessity. For example, it is not good to provide N slots for N/3 content (or) N slots for 3N content.

**Proposed Work:** In order to overcome the problems mentioned above and fulfill the user-AP communication a TDMA-CSMA based optimum throughput distribution is provides. In this paper, a TDMA-CSMA integrated

Table 1: Simulation Parameters Initialized in NS2 Software

Area	1200 x 1200
Nodes	10, 20, 30, 40, 50, 100
Packet Size	50
Transmission Protocol	AODV
Application Traffic	CBR – TCP - UDP
Simulation Time	50 ms
Queue Type	Priority Queue
Propagation Model	Two Ray Ground Model
Antenna Model	Omni Antenna
Routing Protocol	AODV
Initial Energy	100 J
Types of Attacks	Sinkhole, Sybil, General

throughput distribution is applied to allocate an optimized throughput for every AP according to the requirement. It avoids conflicts and provide throughput to every APs according to their communication with the number of user. Also the throughput provision is provided in a periodical manner. In order to simulate the proposed approach the parameters used in our simulation are shown in Table 1.

The proposed approach is developed as programming procedures in TCL language and configured the back end software Network Simulator-2.34. There are five rounds of operations is made in NS2 by changing the number of nodes in the network. The number of nodes is 20, 40, 60, 80 and 100 in each round 1 to 5 respectively.

**Network Model:** In a demonstration network consists of nodes linked by its relatives. The nodes representing blocks, entities, modules, etc, while the relation on behalf of channels, connections, etc. The organization of how fixed elements (i.e. nodes) in a network are interrelated collectively is called topology. In which, first constructing a network in wireless environments with number of nodes or clients, access point. Through the access point each and every node communicates with each other. In this network topology, distribution of users is uncertainty. In a network, much number of clients can transmit the data to other clients, so there is no limitation among the nodes for transmission.

**Sensing Model:** In Sensing methodology, the network topology can be sensed fully by using CSMA. Every nodes and Access Points can be sensed repeatedly whenever a transmission begins. If the sensing result is known to be ideal then the node begins data transmission. Otherwise, the node would remain for the achievement of another on going process. After that, the node starts its data transmission. CSMA splits the data contents into number of slots.

**Interference Model:** Interference between two nodes can be explained elaborately by the following process. First, the node1 have to be interfering with its Access Point and then the node has to be interfering with its Access Point 2. As a final point, the access points of the node1 and node2 have to interfere for getting a proper data transmission or communication of two nodes.

**Starvation Model:** Consider three APs are inter connected, each of which has one related user. Each user wants to upload its data to its AP and imagine AP 2 interferes with both APs 1 and 3, while APs 1 and 3 do not obstruct with each other. so, that AP 2 comes to be malnourished when it contends with both APs 1 and 3, whereas it achieves a good fair share when it contends with only one of them. This example shows that asymmetric contention among APs in an uncoordinated resource sharing surroundings can lead to a grave grievance problem. Unfortunately, occurrence of starvation in some asymmetric contention scenarios is quite common in real-world AP deployments.

**AP Throughput Model:** After identifying the starvation, there is a delay in any kind of data transmission among more number of users. So for avoiding this latency between access points and between clients, the provisioning of throughput is needed for those APs. By using integrated CSMA-TDMA, the maximum throughput can be provided and guaranteed.

**Performance Model:** Throughput is known as the rate of success delivery of data transmission among more number of users. In inter Access point deployment, the throughput needed by each Access Point can be provided by using CSMA was less compared to the integrated TDMA– CSMA. As well as, Access Points need more energy and time for any process to be done in CSMA.

**MAC Protocols:** The mass extensively used MAC procedure in MANETs is the IEEE 802.11 DCF (CSMA/CA+ RTS/CTS) method. In 802.11, movable nodes try to keep away from collisions with mover sensing before communication. If the channel is active, the node will postpone communication and enter into back off status. Otherwise, the nodes will start the RTS/CTS dialog course to imprison the channel and then pass on the packets. The CSMA/CA scheme successfully

reduces the quantity of probable collisions. The RTS/CTS is also supportive since it will preserve the channel spatially and provisionally. RTS/CTS trade is supportive in avoiding secreted mortal problem, since any node overhearing a CTS message cannot broadcast for the period of the transport. However, this process cruelly limits accessible bandwidth. Dimensions show that the stream can only get about 2% of accessible bandwidth. Really, such non-natural limitations may bring about a devastate of the wireless link resources. For example, in the following examples the two data streams are companionable, but this is not allowed by the CSMA/CA scheme.

Collisions may also occur and in some cases may humiliate the presentation. This is even inferior when the mobile nodes are of elevated solidity. A straightforward idea to conquer this insufficiency is to transmit CTS or its distinction numerous times such that other nodes clear the channel for the initiating node. However, recreation study shows that the probable expand of this approach are outweighed by the consequent overhead. In PCM, RTS/CTS packets are transmitted with a max command level,  $P_{max}$ . But for data packets, they are transmitted with a minor power level. In order to keep away from a probable accident caused by the condensed carrier sensing zone, PCM occasionally increases the communication power. ACK packets are transmitted with the least amount required power to achieve the resource node. In MAC layer, preventable collisions should be avoided, since retransmissions source further power utilization and additionally increase packet delay. MAC protocols based on RTS/CTS, have been projected to improve these troubles. However, as the numeral of movable terminals increase, more liveliness will be consumed for channel argument and the network performance will humiliate quickly. On the other hand, as explained in the subsequent, RTS/CTS-based protocols do not entirely solve the hidden mortal and uncovered terminal troubles.

In this paper initially the class of imperfect communication drained the energy of the radio/sensor devices while they are in active mode; else it is in sleep mode to save energy. Using content based slot allocation in MAC protocols, make the sensor devices in sleep mode as much as possible. A malicious user who knows about MAC protocol can exploit the environment. In this research, it is analyzed that the functionality of the all the types of MAC protocol [T-MAC,

Table 2: Compare CSMA with TDMA

Parameters Noted	CSMA without TDMA	CSMA with TDMA
Throughput Guarantee	22468.39	227077.83
Energy Saved(%)	2.70	91.16
End to End Delay	1.69227	0.12199

S-MAC, -MAC, ESR-MAC], from that analysis, design and describe a new mechanism for MAC-layer, to reduce the resource consumption for wireless networks. Most of the researches are motivated to design, implement and evaluate a novelty suite for low-overhead, cross-layer and platform independent which can mitigate the resource-consumption attacks as well challenge the issues draining energy. The clustered anti-sleep-denial suite incorporates a low overhead, no-replay mechanism, a rate-allocated-contention-slot mechanism and detecting traffic jam and mitigation to identify the sensors in wake up mode. All these mechanisms are combined to improve the QoS of in wireless networks.

Table 2 shows that the throughput improvement of integrated CSMA - TDMA. And it shows the Energy saved, End to End Delay between existing and proposed model.

## RESULTS AND DISCUSSION

During the Simulation the obtained results in terms of throughput, delay and remaining energy are calculated and the values are plot in the form of graph, given below. It is well known that the throughput value is increased in terms of number of nodes deployed in the network and number of data packets transferred. In this paper, the obtained throughput is increased according to the number of nodes and loads and extensively higher than the existing system.

Figure 1 shows that the throughput improved in each round of simulation with various numbers of nodes deployed in the network. The throughput value is increased gradually in each round and higher than the existing approach.

Figure 2 shows the delay taken to transmit the data packets. While number of node increases the delay taken to transmit is also getting increased. According to the number node, the number of packets increased as well as the delay also getting increased. At the same time the delay taken by the proposed system is less than the existing system and hence the proposed approach is efficient.

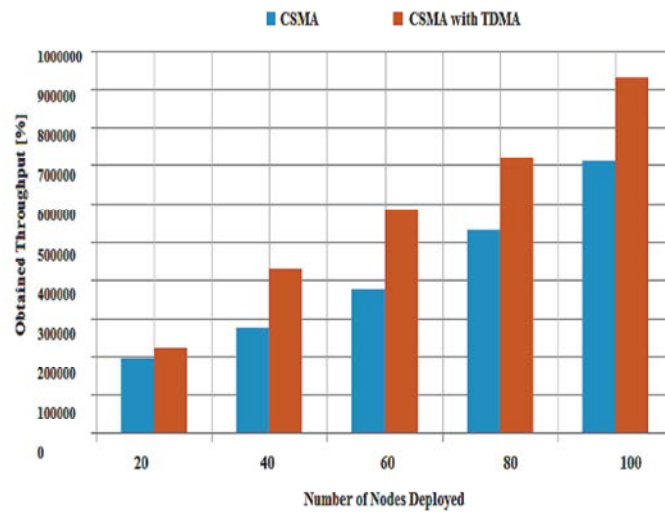


Fig. 1: Number of Node versus Obtained Throughput

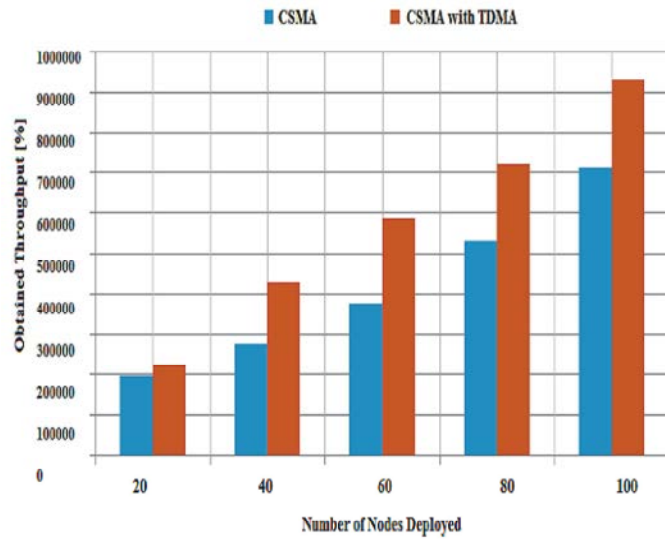


Fig. 2: Number of Node versus Delay

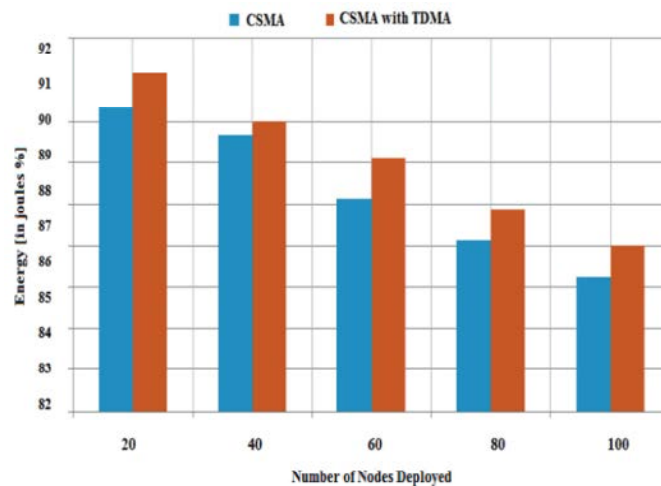


Fig. 3: Number of Node versus Remaining Energy

From Figure 3, it is understood that the remaining energy after each round is decreased gradually. It is because of the number of nodes and number packets transmission is increased in each round. At the same time the remaining energy after each round is decreased and comparatively higher than the existing system.

## CONCLUSION

The main objective of this paper is to increase the throughput in heterogeneous network. Since heterogeneous networks are communicating all the way through APs it is necessary to get better the throughput by concentrating in AP level user communications. Combining with CSMA and TDMA the efficiency of the throughput is increased in terms of scheduling and time allocation in a defined manner. By providing a scheduled slot allocation and required throughput for each AP will make the communication by avoiding starvation. From the results and discussion it is concluded that the throughput obtained using the proposed approach is better than the existing approach. To improve the efficiency of verifying multiple access points, the throughput of each access point is further extended to support a healthy data transmission. The work done by integrated CSMA-TDMA is how to maximize the throughput and then how to provide the required throughput to each nodes and access points.

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## REFERENCES

1. Wang, X. and K. Kar, 2005. Throughput Modelling and Fairness Issues in CSMA/CA based ad-hoc Networks. In the Proceedings of the 2005 IEEE INFOCOM Conference, pp: 23-34.
2. Hua, C. and R. Zheng, 2008. Starvation Modeling and Identification in Dense 802.11 Wireless Community Networks. In the Proceedings of the 2008 IEEE INFOCOM Conference, pp: 1696-1704.
3. Choi, J. and K.G. Shin, 2012. QoS Provisioning for Large-scale Multi-AP WLANs. Elsevier-Ad Hoc Networks, 10(2): 174-185.
4. Akella, A., G. Judd, S. Seshan and P. Steenkiste, 2005. Self-Management in Chaotic Wireless Deployments. In the Proceedings of the 2005 ACM Mobicom Conference, pp: 185-199.
5. Mhatre, V.P., K. Papagiannaki and F. Baccelli, 2007. Interference Mitigation through Power Control in High Density 802.11 WLANs. In the Proceedings of the 2007 IEEE INFOCOM Conference, pp: 535-543.
6. Shrivastava, V., D. Agrawal, A. Mishra, S. Banerjee and T. Nadeem, 2007. Understanding the Limitations of Transmit Power Control for Indoor WLANs. In the Proceedings of the 2007 ACM/Usenix ICM Conference, pp: 351-364.
7. Bejerano, Y. and R.S. Bhatia, 2006. MiFi: A Framework for Fairness and QoS Assurance for Current IEEE 802.11 Networks with Multiple Access Points. IEEE/ACM Transactions on Networking, 14(4): 846-862.
8. Chiochan, S., E. Hossain and J. Diamond, 2010. Channel Assignment Schemes for Infrastructure-based 802.11 WLANs: A Survey. IEEE Communications Surveys and Tutorials, 12(1): 124-136, 1<sup>st</sup> Quarter.
9. Shrivastava, V., N. Ahmedand, S. Rayanchu, S. Banerjee, S. Keshav, K. Papagiannaki and A. Mishra, 2009. CENTAUR: Realizing the Full Potential of Centralized WLANs through a Hybrid Data Path. In the Proceedings of the 2009 ACM Mobicom Conference, pp: 297-308.
10. Jiang, L. and J. Walrand, 2010. A Distributed CSMA Algorithm for Throughput and Utility Maximization in Wireless Networks. IEEE/ACM Transactions on Networking, 18(3): 960-972.
11. Liu, J., Y. Yi, A. Proutiere, M. Chiang and H.V. Poor, 2009. Convergence and Tradeoff of Utility-Optimal CSMA. In the Proceedings of the 2009 IEEE Broadnets Conference, pp: 1-8.
12. Ni, J., B. Tan and R. Srikant, 2010. Q-CSMA: Queue-length based CSMA/CA Algorithm for Achieving Maximum Throughput and Low Delay in Wireless Networks. In the Proceedings of the 2010 IEEE INFOCOM Conference, pp: 1-5.
13. Liew, S.C., C. Kai, J. Leung and B. Wong, 2009. Back-of-the-Envelope Computation of Throughput Distributions in CSMA Wireless Networks. In the Proceedings of the 2009 IEEE ICC Conference, pp: 1-6.

14. Mo, J. and J. Walrand, 2000. Fair end-to-end window-based congestion control.. *IEEE/ACM Transactions on Networking*, 8(5): 556-567.
15. Neely, M.J., E. Modiano and C.P. Li, 2008. Fairness and Optimal Stochastic Control for Heterogeneous Networks. *IEEE/ACM Transactions on Networking*, 16(2): 396-409.