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A SELF ADAPTIVE BASED CONTENTION WINDOW FOR ADVANCED INFRARED CSMA/CA MAC PROTOCOL FOR WIRELESS LAN'S

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ABSTRACT

Advanced Infrared (AIr) is a suggested framework for Infrared Data Association (IrDA) for interior infrared LANs. Advanced Infrared (AIr) is the standard MAC prototype for wireless infrared LANs and is capable to assist point to multiple point transaction although it is not precisely constructed for such prototypes. A back off approach is a methodology for the wireless system MAC layer protocol to resolve a collision whenever the network is shared with two or more nodes. Since for small networks, the throughput of the existing model degrades and propagation, transmission delay increases due to large contention window size with the augmented number of empty CAS that resulting in a significantly lower consumption than optimal. This paper provided a flexible and self-adaptive contention window back off methodology that greatly enhances the throughput by adjusting the optimum CW updating aspect rendering to the hypothetical study. This approach efficiently diminishes the number of collisions and enhances the network consumption. In AIr MAC CSMA/CA protocol, the simulation result showed that the novel back off approach efficiency is much improved compared to the existing Linear Adjusting CW back off approach.

Keywords: *Wireless LANS, Advanced Infrared, Infrared Data Association, Contention Window Size, Back-off Algorithm*

1. INTRODUCTION

The world of today has become quite fast and reliable mainly because of the wireless communication. Due to which, currently there have been an augmenting need in the direction of smart electrical products and movable workplaces with the growth of wireless packet estimating technique. Wireless systems required to offer much effective and consistent communications amongst these moveable stations [26]. The wireless system denotes to the usage of radio frequency signals to share data and resources amongst wireless appliances. The augmenting populace of these kind of networks are primarily pertaining to its inherent properties of inexpensive, simple and flexible distribution, self-association and alignment etc. Amongst wireless systems, WLAN, MANETs, WMN and VANETs could be cited. These networks could be congregated into two chief categories, infrastructure centered wireless prototypes such as WLAN and infrastructure less prototypes such as MANETs, VANETs. The earlier category necessitates a centralized element to manage the networks dissimilar to the second category that do not need such element.

The IEEE 802.11 is a worldwide Framework for WLANs that was permitted by IEEE in 1997 and is currently fairly global in accessing networks. WLANs depending on IEEE 802.11 [27] are being very prevalent and extensively organized in public and private domains. Up to now, the principal applications of Internet through WLANs are client and server appliances like web-browsing, transferring files, e-mails etc. The WLAN are extensively installed in house, industries and public regions. In such systems, the foremost need of operators is guaranteeing reasonable and effective distribution of the mutual bandwidth amongst challenging accessible nodes while exploiting the network throughput. The IEEE 802.11 [3] standard describes a mutual MAC layer that proposes numerous operations associating wireless accessing networks. If the prototypes on the MAC layer is fixed and cannot alter itself to the varying network atmosphere, it would consequent in performance deprivation. Generally, this layer inaugurates, accomplishes and preserves communication amongst IEEE 802.11 nodes by synchronizing its access to common radio channel and using prototypes that enhances the communication above the communal wireless medium. IEEE 802.11 MAC offers two kinds of access mediums: Distributed Coordination Function (DCF) [4] and Point Coordination Function (PCF). In the initial medium, Carrier Sensing Multiple Access with Collision Avoidance (CSMA/CA) is employed as a preliminary access device, and it is considered to assist finest traffic that do not need any definite service requirements.

AIr [1, 2] is the standard MAC prototype for infrared LANs and is capable to assist point to multiple point broadcasting although it is not explicitly considered for such communication. Identical to the IEEE 802.11, AIr exploits CSMA/CA and back off approach for collision avoidance. AIr MAC uses CSMA/CA methodology to reduce collision likelihood. A station desiring to transfer, irrespective of transmission approach, it initially entreats the Collision Avoidance (CA) technique so as to reduce collisions with another stations. Taking into account, the AIr transmission channel a competing station constantly invokes the CA technique prior to RTS frame broadcasting. If the cannel is busy, the competing station initially delays till the channel is free and the subsequent contention epoch begins. The contention epoch is inserted and a station is permitted to communicate merely at the commencement of a Collision Avoidance Slot (CAS).

The long CAS duration employed in this method may degrade system utilization if the idle and crashing CAS in course of the contention epoch is more. This number hinge on the quantity of the challenging stations and on CW values employed through the stations. Since stations could merely alter its CW values after fruitful reservations and collisions, the CW regulation approach attains the highest significance if maximal utilization is to be accomplished. For large networks, the Existing Linear adjustment algorithm and parameter values of AIr MAC protocol has its benefit of higher data rate while transferring the packets that result in much empty CAS and less colliding CAS than optimal and diminishes the comparative influence of larger contention overhead, utilization is considered to perform satisfactorily. Whereas, for small networks, the throughput of the model degrades and propagation and transmission delay also increases due to large contention window size with the increased number of empty CAS that results in a significantly lower utilization than optimal.

So as to overcome the above mentioned problem, this paper had proposed a novel Back off Algorithm or a Contention Window sized algorithm to obtain good throughput performance and a satisfactory utilization of the AIr MAC CSMA/CA protocol despite of the size of the network (might be large or small) and also considers the surrounding environment such as number of station, carrier sensing medium, size of the packet etc. This paper proposed a Back off Approach depending on self-adaptive contention window update factor and enhances the throughput through locating the optimum CW updating factor. The self-adaptive tuning scheme is presented depending on the Collision time and Idle time of the Back off approach. The Experimental Analysis of the proposed approach showed that the novel back off algorithm performance is much better than the existing Linear CW Adjustment based Back off Algorithm.

1.1 Organization of the paper

A brief introduction the Wireless Communication and Wireless Local Area Networks along with the motivation for this proposed approach is given in this section. The section 2 briefly discussed the existing works that has been done in the Advanced Infrared MAC protocol and existing techniques for the various Contention Window size and Back off approach is given. The brief explanation of the Infrared Data Association and Advanced Infrared Data association procedure and the process of data packet passage is given in section 3. The section 4 gives comprehensive explanation of suggested Self Adaptive based Contention Window Sized Bach Off procedure for the Advanced Infrared MAC protocol. The experimental results and its brief analysis is given in section 4 followed by the conclusion for the suggested methodology is given in section 5. The references for the suggested approach is given section 6.

2. LITERATURE SURVEY

Numerous investigation efforts are being conceded out to learn and enhance the efficiency of IrDA AIr and IEEE 802.11 prototypes. Wireless techniques employ CSMA/CA structures at the MAC sub-layer

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using Request-To-Send/Clear-To-Send (RTS/CTS) medium registration that function in a very comparable method. Nevertheless, there are substantial variances in the collision avoidance and medium access approaches.

Experimental Results are given in [1, 2] for IrDA AIr and [3, 4] for IEEE 802.11. Scholars in [17] suggested an evaluation of the two prototypes however does not offer a widespread study and its effort was restricted merely to throughput efficiency. Currently, extensive investigation activity has focused on demonstrating the MAC layers of both prototypes through engaging scientific analytical methodologies. In [18], a flexible scientific study was introduced through exploiting a bi-dimensional Markov chain and estimated AIr throughput performance. In [19], the efficiency improvement given in [18] was prolonged through offering further sophisticated derivation and humble scientific equivalences for the average packet delay of the AIr protocol. In [20, 21], a Markov chain pattern was employed to investigate DCF functions and evaluated the drenched throughput of IEEE 802.11. In [22], using Markov chain demonstration, the packet delay and additional performance matrices was estimated for IEEE 802.11.

Additionally, in [23, 24], the earlier studies are further prolonged through suggesting some improvements so as to augment IEEE 802.11 protocol effectiveness. Further precisely, in [24], the usage of packet over flooding was presented so as to minimize the overhead price. The focal notion of packet over flooding was dependent on the broadcasting of more number of data packets whenever the channel accomplishes control of the medium while recollecting the longer standing justice offered by the IEEE 802.11. Furthermore, study in [25] has exhibited that although the data rate could be substantially more, MAC efficacy is however restricted using a maximal value. Therefore, these protocols tries to reduce the prevailing overhead, which is the foremost cause for system inadequacy.

Countless experiments in research domain has been explored for CW dynamic alteration to attain performance enhancement above prevailing Back off Approaches [5–13]. Nevertheless, certain could merely attain a substantial efficiency beneath some circumstances compared to others, although hypothetically optimum that are too complex for a real-world employment. As the CW rearranged structure of Back off Approach might tend to needless collisions and rebroadcasting while the contention level has not released, in [5], MILD (Multiplicative Increase Linear Decrease) CW adjustment method was presented to resolve the issue. A node rises its CW through multiplying it with 1.5, and diminishes with 1 upon an achievement. It likewise comprises a CW replica device to address the equality issue. By flattening the CW reduction, this structure accomplishes fine whenever the network weight is hefty. Nevertheless, when the number of energetic channels fluctuates abruptly from higher to lower, MILD could not adjust adequate due to “linear reduction”. Numerous alike structures are suggested after MILD, comprising EIED [6], LMILD [7], MILMD [8], and SD [9]. Entire structures goals at making the CW fluctuate round the optimum value deprived of complex runtime approximation, they merely fluctuate in linear / multiplicative rise / fall aspects.

In [10], scholar established a p-persistent IEEE 802.11 prototype that cautiously estimates the standard prototype. Depending on this, a logical approach is obtained to research the hypothetical volume boundary of the p-persistent prototype and calculate the optimum p that exploits the capability. Nevertheless, this necessitates an approximation of numerous energetic locations. On the other hand, Asymptotically Optimal Backoff (AOB) is suggested in [16] that measures the network contention phase with two approximations: the slot consumption and the average dimension of communicated frames. AOB adjusts a CW dimension that exploits the channel consumption. A broadcasting previously permitted using BEB is postponed by AOB in a probabilistic manner that hinges on the network congestion stage.

Two novel methodologies, Idle Sense [14] and GCA [15] are presented currently. Through Idle Sense, every channel perceives I, the average number of idle slots among two successive hectic slots. It formerly trusts on the AIMD amendment of CW permitting to an estimator of I. Deprived of employing collision as a sign to minimize broadcasting endeavors, Idle Sense could decouple collision recognition from weight regulation. In [15], GCA (General

Contention window Adaptation) is considered to decompose the need for both justice and effectiveness to the issues of selecting appropriate utility functions and noticeable channel states, so as to attain random bandwidth distribution and effective channel operation. Comparable to Idle Sense, GCA recognizes the optimum constant point that exploits channel operation, and delivers resolutions to regulate the constant point of GCA adjacent to optimum point.

3. ADVANCED INFRARED MULTI ACCESS CSMA/CA PROTOCOL

The accumulative distribution of moveable computers and mobile devices tend to an aggregating challenge for wireless connections. Infrared introduces numerous benefits over transistor for indoor wireless connectivity however infrared relation eminence is influenced by ambient infrared noise and using less powerful broadcasting phase pertaining to eye safeguard restrictions. The Infrared Data Association (IrDA) has industrialized the extensively employed IrDA 1.x protocol for short range, narrow beam, point to point connections. Infrared and radio are considered as candidates for wireless connectivity where infrared radiation offers several advantages over radio. Infrared links utilize low cost components with small physical size and low power consumption. IrDA suggested the AIr prototype specifications for indoor, high-speed, low cost and multipoint wireless communications. IrDA addressed the need for indoor multiple point relation with the expansion of the AIr protocol heap. The IrDA has suggested AIr for shorter range communication by means of ultraviolet light.

IrDA suggested the Advanced Infrared (AIr) [17] framework for wireless LANs by outspreading the IrDA 1. x protocol heap and comforting the range and seeing position limitations modelled by the IrDA 1. x physical layer. AIr ports have a inspecting of axis position amongst 60 and 75 degrees to attain multiple point connectivity with another mechanism in order. AIr devices take the benefit of line of sight (LOS) broadcasting line however could likewise communicate depending on on infrared signal replications from the maximum and partitions if the LOS line is blocked. AIr data rate is 4Mbit/s however lesser data rates (up to 256Kbit/s) could be exploited if the link worth is lower pertaining to higher link distance, strong background light andr non-LOS line. Adaptive data rate intents to attain entire AIr channels functioning in the similar office or chamber. AIr broadcasting range is nearly 5m at Mbit/s and 10m at 256 Kbit/s for LOS paths. AIr frameworks offers energetic device detection processes, priority delivery service for time sensitive information, power management and co-survival with IrDA 1. X appliances [44]. AIr employs CSMA/CA procedures for medium access and do not allot master and slave roles to collaborating channels.

The AIr proposal preserves the investment in IrDA 1. x upper layer applications by replacing the physical and the link layer of the IrDA 1. x protocol heap. A novel physical layer, Air PHY, is suggested that supports wider angle infrared ports so as to obtain multiple point linking [18]. AIr PHY base rate is 4 Mbit/s. AIr PHY employs Repetition Rate (RR) coding to attain the augmented broadcasting range essential for wireless LAN linking. The transmitter trades speed for range by repeating the transmitted information RR times so as to augment the seized possibility at the receiver. IrLAP, the IrDA 1. x link layer is segregated into three sub-layers, the AIr Medium Access Control (AIr MAC), the AIr Link Manager (AIr LM) and the AIr Link Control (AIr LC) . AIr MAC is accountable for coordinating access to the shared infrared medium and for efficiently implementing RR coding. AIr LC provides guaranteed information delivery to the remote device.

The AIr MAC [19] layer is a CSMA/CA aided media access prototyping using an RTS/CTS media registration structure with a multiple packet 'data burst' transmission. The principle, upon receiving a data transmission request, is for the station to wait a random number of Collisions Avoidance Slots (CAS) before transmitting an RTS frame. After receiving a CTS reply from the target station, the requester will transmit data for the duration of the reservation, after which the station will send an EOB (End Of Burst) frame to terminate the reservation. The target channel will reply with an EOBC (End of Burst Confirm) frame to confirm the reservation termination. Acknowledgements or sequenced acknowledgements can be returned from the target station after each data packet sent if required. All other stations that 'hear' the RTS/CTS exchange will know to refrain from transmission until the reservation period

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(specified in both the RTS and CTS packets) has expired. Un-reserved data packets can also be transmitted individually outside of a media reservation, but still require the use of collision avoidance slots to avoid packet collisions. The AIr frame format and data transfer mechanisms for specific reservation modes is shown in figures 3 and 4.

4. PROPOSED SELF ADAPTIVE BASED CONTENTION WINDOW SIZING FOR BACK OFF APPROACH

In this section, this paper proposed a Back off Approach depending on self-adaptive contention window updating feature and enhances the throughput through adjusting the optimum CW updating aspect. A 2-dimensional Markov Chain is utilized on the back off approach and adopted a self-adaptive approach to obtain the novel improved algorithm. Existing Back Off algorithm in the AIr MAC CSMA/CA protocol employed linear CW updating methodology irrespective of how the network weight alters that consequences in unnecessary collisions pertaining to insufficient CW growth factor. When network load is less, the CW factor is very less to permit for high channel consumption because to high back off time. So as to improve the network efficiency, this approach modifies the CW updating factor rendering to present position. The optimal CW updating factor c is considered conferring to the number of competing channels

$$s = \bar{n}\sqrt{2T} \quad (1)$$

where $\bar{n}$ is the number of competing channels and T is the frames broadcasting period that is given in the unit of slot time as

$$T = \frac{DIFS+T_L+SIFS+T_{ack}}{T_{Slot}} \quad (2)$$

Where T_L refers to the data frame broadcasting period (comprising PHY header), T_{ack} is the ACK frame broadcasting period, and T_{Slot} is a slot time. The manner in which CW update is presented is as follows:

$$CW_{new} = \begin{cases} \max\left(\frac{1}{s}CW_{old}, CW_{new}\right) & on\ Success \\ \min(s.CW_{old}, CW_{new}) & on\ Collision \end{cases} \quad (3)$$

Let s(t) and b(t) be the stochastic procedures signifying the back off phase and back off timer. $b_{i,k}$ is the static likelihood for a channel having back-off level i and back off timer k. According to the Markov Chains symmetries, for every $i \in [0,m], k \in [0, W_i - 1], b_{i,k}$ can be written as

$$b_{i,k} = \begin{cases} q^i b_{0,0} & k = 0 \\ \frac{W_i-k}{W_i} b_{i,0},\ 0 \le i \le m & k \in (0, W_i - 1) \end{cases} \quad (4)$$

where $q = p_c/(1-p_c), p_c = 1-(1-\tau)^{n-1}$. As the sum of static dispersal for entire states that ought to be equal to 1, formerly

$$\sum_{i=0}^{m}\sum_{k=0}^{W_i-1} b_{i,k} = \sum_{i=0}^{m} b_{i,0}\sum_{k=0}^{W_i-1}\frac{W_i-k}{W_i} \quad (5)$$

$$= \frac{1}{2}\sum_{i=0}^{m}\left(b_{i,0}W_i + b_{i,0}\right) = 1 \quad (6)$$

Let W_i be the dimension of CW of every back-off phase, having $W_i = \begin{cases} s^i W & 0 \le i \le m \\ s^m W & i > m \end{cases}$ from the equations (14) to (17), we can get the value of $b_{0,0}$ as $\frac{1}{b_{0,0}} = \frac{W[1-(sq)^{m+1}}{2(1+sq)} + \frac{1-q^{m+1}}{2(1-q)}$. The probability τ that a node transfers in a arbitrarily selected slot is the sum of probabilities of entire states:

$$\tau = \sum_{i=0}^{m} b_{0,0} = \frac{2(1-sq)(1-q^{m+1})}{W[1-(sq)^{m+1}](1-q)+(1-sq)(1-q^{m+1})} \quad (7)$$

4.1 Self Adaptive Tuning Scheme

To resolve survival of the unknown factor $\bar{n}$ and T, let a humble approach that encompasses zero rate, by means of the ratio is $t_{collision}$ to t_{idle}, H, to replicate the congestion level of the network. H is demonstrated as

$$H = \frac{t_{collision}}{t_{idle}} \quad (8)$$

where $t_{collision}$ is defined as the sum of periods of time met through a collision for the period of a back off process and t_{idle} is the sum of idle periods in the course of a back off process. $t_{collision}$ and t_{idle} are portion of the accessible period that is considered as the entire period of time a back off process consumes to resolve a collision. Whole are accessible with the legacy MAC. H could be articulated in terms of the likelihoodsp_{col}, p_{idle} and their equivalent periods of time, T_c and σ through

$$H = \frac{T_c p_{col}}{\sigma p_{idle}} = \frac{T_c{}^{\sigma}[1-(1-\tau)^n - n\tau(1-\tau)^{n-1}]}{(1-\tau)^n} \quad (9)$$

Combining this with Taylor formula yields: $(1-\tau)^n \approx 1 - n\tau + \frac{n(n-1)}{2}\tau^2$

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H can be further simplified $H \approx [(1-\tau)^{-n} - 1 - n\tau]T_c^{\sigma} \approx \frac{n(n+1)\tau^2}{2} T_c^{\sigma}$

Replacing τ with τ_0 gives the optimum value of H_0 as

$$H_0 \approx \frac{n(n+1)T_c^{\sigma}}{2(n\sqrt{T_c^{\sigma}/2}^2} \approx 1 \qquad (10)$$

H_0 showed the optimal rate of $t_{collision}$ and t_{idle}, when attaining the maximal throughput. The hypothetical optimum of H is roughly persistent regardless of the number of challenging nodes. Grounded on this effort, a self-adaptive approach is given to address a variable number of competing nodes. Prior to executing this approach, initially the optimum values of s need to be attained for every scale of conflicting nodes. At the execution time, every node measures its $H_{current}$ from (20) and matches using H_0. Furthermore, let MAX be the threshold for number of observations, and D_H be the threshold floating value of H_0. Every time prior to broadcasting the data, whenever $H_{current}$t is higher (lesser) compared to $H_0 + D_H(H_0 - D_H)$, count is risen (fallen) with 1. If the value of count is more (less) compared to the pre-specified threshold $\text{MAX}(-\text{MAX})$, a higher (lower) s will be accepted to redirect the raised (minimized) scale of challenging nodes comprehended by a node.

As could be viewed, the self-adaptive adjusting structure adjusts to present channel state for obtaining the optimum system throughput in a WLAN. Surrounded at the MAC layer, it has no outlays for the efficiency of upper layer applications.

Algorithm for Self Adaptive Tuning Scheme:

1. Compute $H_{current} = \frac{t_{collision}}{t_{idle}}$
2. If $H_{current} > 1 + D_H$ then $count = count + 1$
   Else if $H_{current} < 1 - D_H$ then $count = count - 1$
   Else $count = count$
3. For $count = count + 1$ and $count = count - 1$
4. If $count > MAX$ then $nodes = nodes\ of\ next\ higher\ scale, count = 0$
   Else if $count < -MAX$ then $nodes = nodes\ of\ next\ lower\ scale, count = 0$
   Else $nodes = nodes\ of\ current\ scale$
5. Now obtain the CW factor s with the information of nodes

5. EXPERIMENTAL RESULTS AND ITS ANALYSIS

The performance of the suggested approach is experimented and analyzed in this section and validated by comparing its results with the existing linear CW adjustment Back off Algorithm in the AIr MAC Protocol. The AIr simulator is developed using the OPNET model and infrared transmission are matched by varying the radio versions of the OPNET modeler. The simulation time is 100s and the number of nodes are variable altering from 10 to 100 with an interval of 10. All the nodes have flow rate of 1000 byte of packets in the direction of their target node. The simulation parameters for the proposed approach is given in Table 1. A diagnostic performance prototype is obtained, and simulation outcome demonstrate authenticity of the suggested prototype. Performance evaluations designate significantly enhanced abilities of the suggested approach in terms of practical channel access and throughput efficiency with regards to AIr protocol.

Table 1: Parameters for Simulation

Parameters For Simulation	
MAC head/bits	224
PHY head/bits	192
RTS/Bits	352
CTS/Bits	304
ACK/Bits	304
Slot time/us	20
SIFS/us	10
DIFS/us	50
Propagation/us	1
Cw_{min}	32
Channel Bit Rate/M bit/s	2

The system throughput of the existing CW linear Back off Approach is compared with the proposed Self Adaptive CW Back off Approach as given in Fig 3 and Table 2. From these, it is clearly observed that the throughput efficiency of proposed approach is higher when compared to the existing technique regarding the number of stations varying from small size network to high size networks.

Table 2: Throughput Efficiency Of The Proposed And Existing System

	Throughput Efficiency	
Number of stations	Linear CW Adjustment Algorithm	Proposed Self Adaptive CW algorithm
10	0.873	0.872
20	0.871	0.871
30	0.865	0.869
40	0.861	0.868
50	0.859	0.865
60	0.856	0.863
70	0.854	0.86
80	0.85	0.858
90	0.848	0.855
100	0.842	0.853

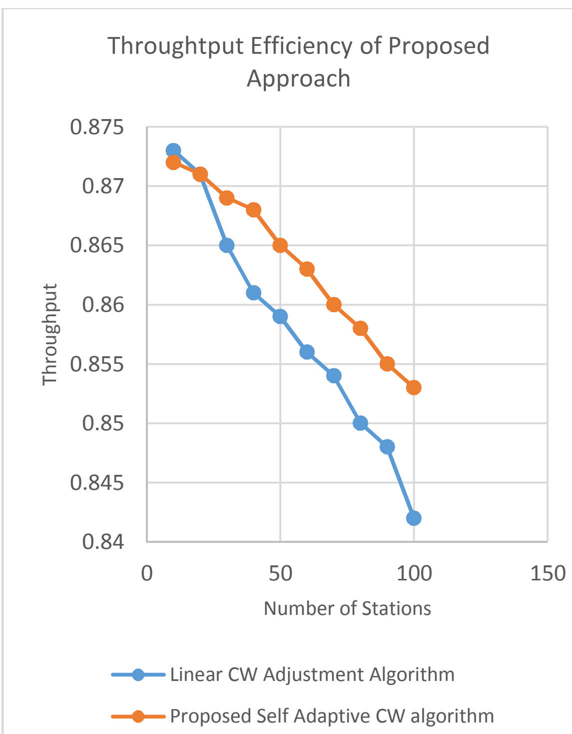

Fig 3: Throughput Efficiency Of The Proposed And Existing System

The frame collision rates are exhibited in Fig. 3 and in given in table 3. The collision rate signifies the number of unproductive broadcasts divided by the number of broadcasts. From the Fig 5 and table 4, it is clearly observed that the frame collision rate is low for the proposed approach as in when compared the existing technique, since the proposed scheme offers a self-adaptive dynamic *CW* adjustment to diminish the number of collisions rendering to the average collision possibility and the adaptable window size considering the network size, number of stations and packet delivery rate.

Table 3: Packet Delay Of The Proposed And Existing System

	Packet Delay	
Number of stations	Linear CW Adjustment Algorithm	Proposed Self Adaptive CW algorithm
10	0.044	0.045
20	0.065	0.056
30	0.092	0.082
40	0.109	0.091
50	0.135	0.099
60	0.154	0.123
70	0.192	0.154
80	0.231	0.192
90	0.263	0.237
100	0.359	0.258

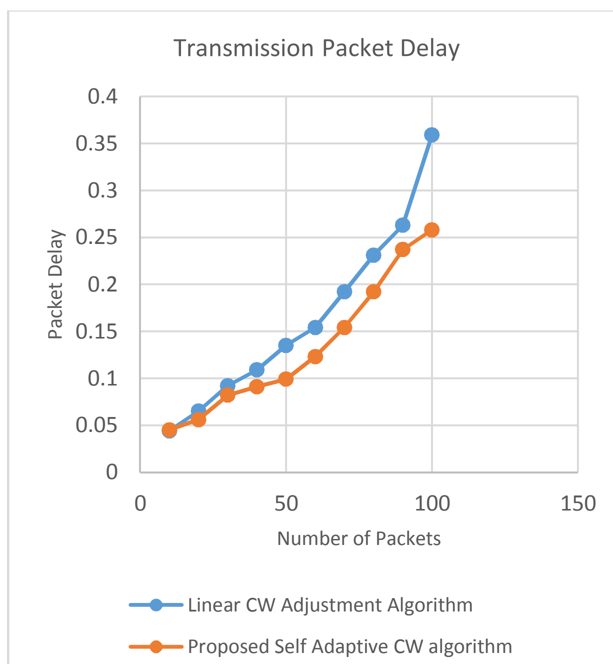

Fig 4: Packet Delay Of The Proposed And Existing System

Average access delay is given as the time intermission when a packet is ready for broadcasting and the time that the packet is obtained appropriately at the MAC target. The average access delay of the enhanced approach is lesser when compared to that of the other approaches in spite of several numbers of competing nodes as shown in fig 5 and table 4. This specifies that the better-quality procedure that could efficiently minimize the likelihood of collision, therefore refining the competence of nodes conflicting for restricted channel resources.

Table 4: Frame Collision Rate Of The Proposed And Existing System

	Frame Collision Rate	
Number of stations	Linear CW Adjustment Algorithm	Proposed Self Adaptive CW algorithm
10	0.132	0.128
20	0.196	0.197
30	0.236	0.237
40	0.251	0.232
50	0.298	0.246
60	0.313	0.267
70	0.356	0.305
80	0.397	0.354
90	0.415	0.389
100	0.496	0.423

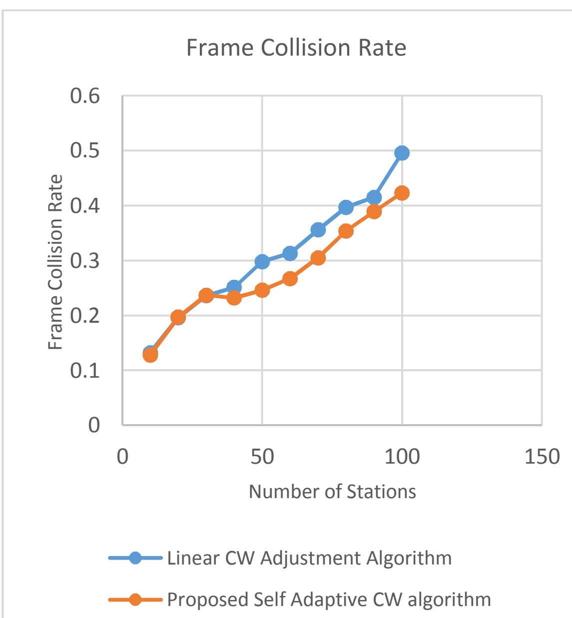

Fig 5: Frame Collision Rate Of The Proposed And Existing System

6. CONCLUSIONS

In this paper, a novel back off approach and the accompanying self-adaptive tuning structure that depends on the Collision time and Idle time of the Back off approach are proposed and extensively evaluated. A contention window factor (s) is employed by including the number of contention stations and Frame transmission time in the unit slot that updated the Contention Window for the Back off approach. This novel self-adaptive back off approach is humble, efficient and experiences no additional overhead to be disseminated amongst the adjacent nodes. This approach is planned not simply to minimize these collisions, however to evade extended waiting period for higher channel consumption. The Experimental Results of this approach showed that the novel back off approach improves the performance metrics in every access mode.

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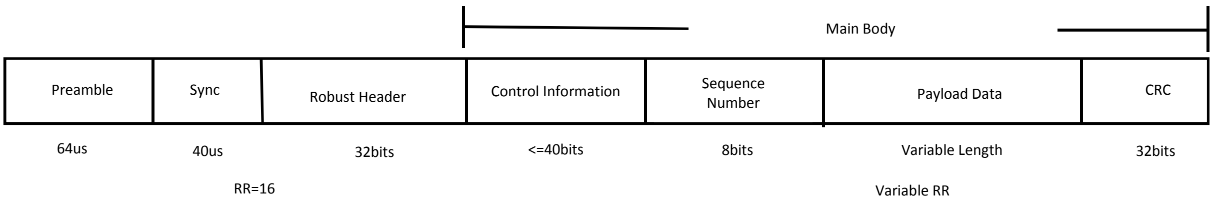

Fig 1: AIr MAC Packet Frame Format

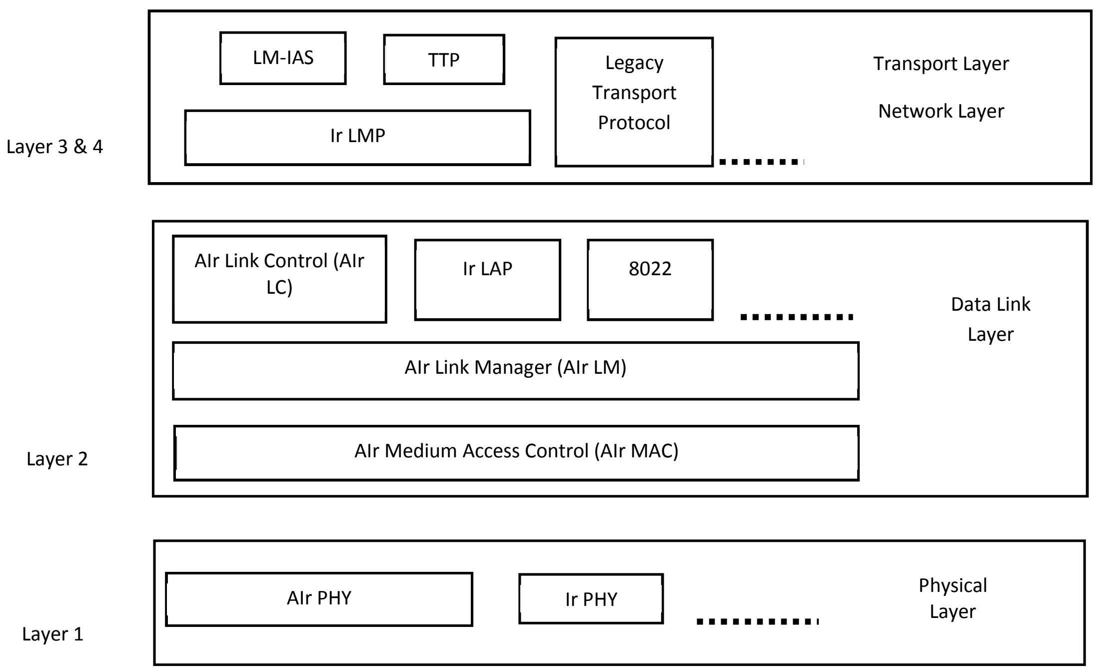

Fig 2: AIr Architecture Overview