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Analysis of RTS/CTS Mechanism to Minimize Hidden Node Problem Using Media Access Control Protocol

Sourabh Pathak[1]
[1]*Lecturer, Department of Electronics and Communication EngineeringM.J.P. Rohilkhand University,Bareilly.*

Abstract: ***By increasing the popularity of wireless network there is used the many advance devices as Mobile phones, tablet etc. But there are two types of problems are produced in wireless network first is Hidden node second is exposed node problem that reduce the efficiency of complete system. Hidden node problem of the network reduce the throughput of the system. RTS/CTS mechanism only solution of this problem. It is the reservation scheme that is used to reduce the frame collisions to each other which are produced by the hidden node problem.***
Problem Statement:The most implemented protocol that is used to reduce the hidden node problem that is MAC protocol. It is used to access control between two media share that medium between competing stations.
Approach:The research has been done till now only for the current number ofactive nodes. An algorithm is used for the optimization of contention window size that is novel back-off.
Key words: MAC Protocol, back-off Algorithm, Contention window

I. INTRODUCTION

The use of wireless network is increased tremendously over past few days. The Media Access control (MAC) protocol has very important role in wireless communication to remove the hidden node problems. The MAC protocol provides the variety of functions that hold the many operations of Local Area Network. We know that in the infrastructure base network there is centralized node is present due to this it is useful for the determine the allocation of channel.We know that in the ad-hoc network the allocation of channel in distributed. But in the wireless network there is problem is created that is hidden node problem which create the media access control.

There are two types of problem created in wireless network first is Hidden node and second is exposed node, the hidden node problem can be explained by the following example as let node A wants to transmit message node B but there is another node C that is also want to transmit message to B but node B does not know about the node C thus we can say that node C is hidden for node A that is hidden node problem.In the hidden node problem there are many types of problems created as packet collisions, dropping of packet, network performance is decreases and network is busy all time, loss of packets. To remove this problem there is mechanism is used that is RTS/CTS phenomenon [12]. This mechanism has the very important role in to reduce the hidden node problem. It is handshaking type of mechanism. In the figure 1 there is showed the RTS/CTS mechanism with network Allocation Vector (NAV).

The Point Coordination Function (PCF) and Ad-hoc network is useful for the infrastructure based network. Distributed Coordination Function (DCF) has the very important role in RTS/CTS mechanism to delivery of packet at the link layer of OSI model and a protocol is used to reduce the collision that is Carrier Sense Multiple Access for Collision avoidance (CSMA/CA). There is another type of ad-hoc network that is Mobile ad-hoc Network (MANET). This type of network is the working group of network that is used in factories', hospitals, offices and other many places.

A. RTS/CTS Mechanism

To remove the hidden and exposed node problem RTS/CTS mechanism is the best solution in wireless network .It is three way mechanism RTS, CTS and Acknowledgement of the response. If any user wants to communicate to other user then first user send the RTS packet to other user then other node/user give the response with CTS packet and allow to communicate to each other with acknowledgement.In this mechanism if the user is free then only give the replies with CTS command. Other user/nodes listen this command a specific time that is back off time that is required to transmit the entire packet to receiver [47]. After receiving the CTS packet successfully then only form the communication between the sender and receiver in properly manner. In the Distribution

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Coordination Function mode if base station has the data packet for the transmission then that station send the RTS packet to receiver. In this mode receiving the correct message/packet from the receiver it waits for the some duration of time that is known as Short Inter Frame Spacing interval (SIFS) and transmitted the CTS command only when it is idle position.In the RTS/CTS mechanism when RTS and CTS packet involve in the time period then it utilized the Network Allocation Vector (NAV), this type of vector shows the time in which the channel is busy. In the DCF mode when station has the packet and ready to transmission then first it check the position of packet, if the station is idle state then it is provided the time interval that is known as Distributed Inter Frame Spacing (DIFS) and Binary Back off Interval that is used for the Contention window size that is normally [0-CW-1]. The 802.11 MAC protocol and DCF mode set the contention window size from CW to CW minimum. If the channel in idle position then back off timer is continued but if

The channel is busy then backoff algorithms stop the timer.When receiver receives the correct message it waits for the time period that is known as Short Inter Frame Spacing (SIFS). An acknowledgement is very important for the sender for successful transmission. Toavoids the collision RTS/CTS mechanism has the very important role in wireless network. Contention window size that is used for to control the back-off algorithms.

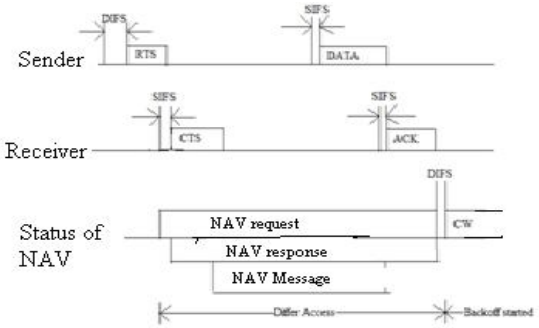

Fig. 1: Data transmission with RTS/CTS

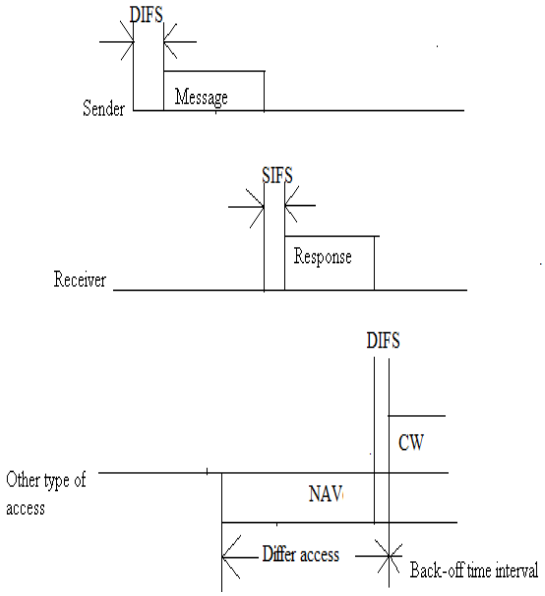

Fig. 2: Data transmission without RTS/CTS

II. RELATED WORK

Wireless networks need the contention window control in IEEE 802.11 MAC protocol. The contention window contains which has the RTS/CTS mechanism. For the transmission of real data there is necessary thing that is to reserve the slots for specific duration.Utpal Paul, AnandKashyap, RiteshMaheshwari, and Samir R. Das [1] analyse the interference between nodes and links in a wireless network using passive control of wireless traffic.Sanjay Shakkottai and Theodore S. Rappaport, The University of Texas at

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Austin Peter C. Karlsson, TeliaSonera Sweden[2] told about the PCS and cellular system that collides with each other to remove this type of problem there is another concept is used that is hold the integration of data and voice in Ethernet wireless point and cellular network.Luciano Bononi, Marco Conti, and Enrico Gregori [3] told about in distributed system for contention window control in IEEE 802.11 wireless LANs.This type of phenomenon is known as Asymptotically Optimal Back-off (AOB), that is accepting the moving size of contention window size.

Lin Dai, Member, IEEE, and XinghuaSun [4] told about the analytical framework that is used for study the stability, throughput, and delay performancein homogeneous buffered Distributed Coordination Function (DCF).

Paal E. Engelstad [5] told about the Enhanced Distributed Channel Access (EDCA) mechanism in IEEE 802.11e.

HwangnamKim [6]told about that envelop a model-based frame scheduling scheme that is , known as MFS, to increases the capacity of IEEE 802.11 standard, operated in wireless local area networks (WLANs) for both user datagram protocol (UDP) traffic and transmission control protocol

Alberto Lopez Toledo [7] explained about in CSMA/CA media access control layer denial- of-service attacks that does not require any modification to the existing protocols.

AbderrahimBenslimane [8] explained about in an analytical model to study the effect of jamming on WLANs.

Guobin Liu, JiaqingLuo, QingjunXiao, Bin Xiao[9] explained about in existence of a unique Nash Equilibrium point that is based on Based an equilibrium analysis, they discuss the condition under which a defense strategy will increase a dynamic retransmission mechanism defense strategy and utility of the network .

RohitNegi, ArjunanRajeswaran [10] explained about in Reservation based Medium Access Control (MAC) protocols such as the 802.11 and Distributed Coordination Function (DCF), that are used to to maximize efficiency, throughput by using small control packets.

KonstantinosPelechrinis, MariosIliofotou and Srikanth V. Krishnamurthy [11] explained about in a detailed up-to-date discussion on the jamming attacks recorded in the literature.

AravindVenkatarama, CheritaCorbettcherita, RaheemBeyah [12] explained about in an abstract methodology for detecting DCF parameter manipulation.

ByungJoon Oh and Chang Wen Chen [13] explained about in a cross-layer design for a reliable video transmission over wireless ad hoc networks that is based on multichannel MAC protocol with Time Division Multiple Access scheme.

III. METHODOLOGY

The methodology is used for contention window control due to which call could not permanently block. The phenomenon is used here that is related to state of conversion. There are eight states used for conversation of call. A back off algorithm is used here for contention window control. The lost of packet is involved the collision and channel error. The RTS/CTS mechanism is used here to check the states of call or node. The table 1 indicate the two value 0 and 1, where 0 indicates theUnsuccessful transmission and 1 is successful transmission.Here two parameters are used y and z for the updating of contention window size control.

In the figure 3, A flowchart is made that is related to the channel state and algorithm for successful transmission. In the flowchart is showed that if collision is detected then the channel state set to be 0 conditions. If the collision is not detected then channel state set to be 1 and successful transmission is possible.

Table1: Channel state

Channel State	Contention Window
000	CW=CW*(y*z)
001	CW=CWmin
010	CW=CW*(y*z)
011	CW=CWmin
100	CW=CW*(y*z)
101	CW=CWmin
110	CW=CW*(y*z)
111	CW=CWmin

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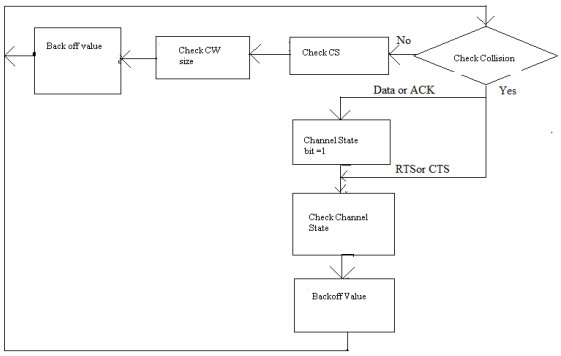

Fig. 3: Flowchart of Channel state

IV. SIMULATION/RESULT

For the simulation this type of mechanism proposed the MAT lab software version 8.1 and resolves the efficiency, Packet delivery ratio, average end to end delay and mobility at different motion scale. When run the program then get many things related to the RTS/CTS mechanism in terms of successful transmission, total transmission, total acknowledgement, estimate time, total collisions, unreachable packets, unreachable acknowledgement,and efficiency. For the successful transmission and to remove the collision there are following parameters are used assimulation time= 0.2sec, Motion of random scale= 0 km/hr,5 km/hr,10 km/hr**,** Frame size=8184

A. Packet Delivery Ratio (PDR)

The packet delivery ratio is defined the ratio the number of packets originated by the application layer source to packet received by the final destination.

B. Average end to end delay to receive the packet:

average end to end delay is defined the average time requiredtime to receive the packet.

C. Mobility at different motion scale

Here consider the mobility at different motion scale as static motion or we can say static node, 5km/hour and 10km/hour. There are following result shown in the graph these show the best result of packet delivery ratio, Average and to end delay, and mobility at different motion scale.

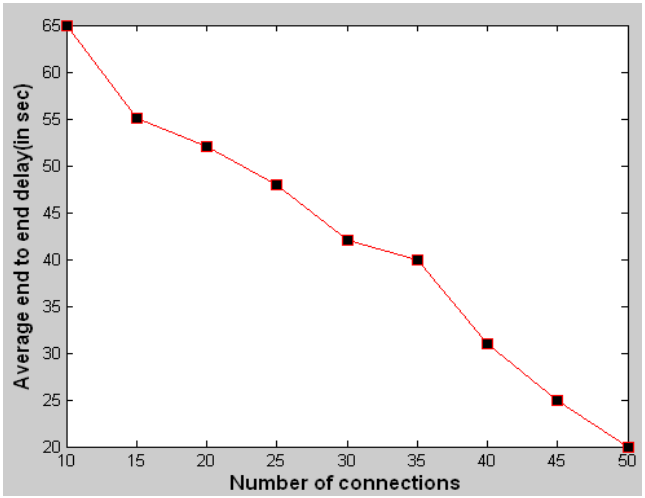

Fig. 4: Average end to end delays (in sec.)

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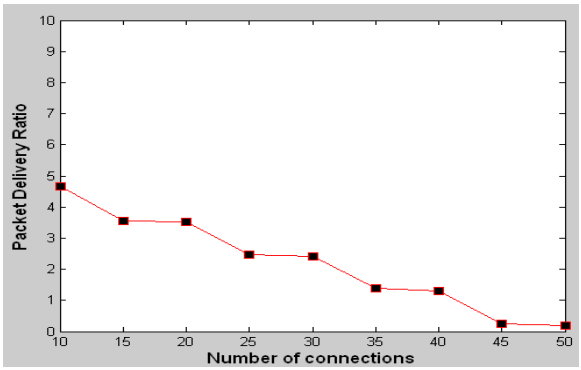

Fig. 5: Packet Delivery Ratio

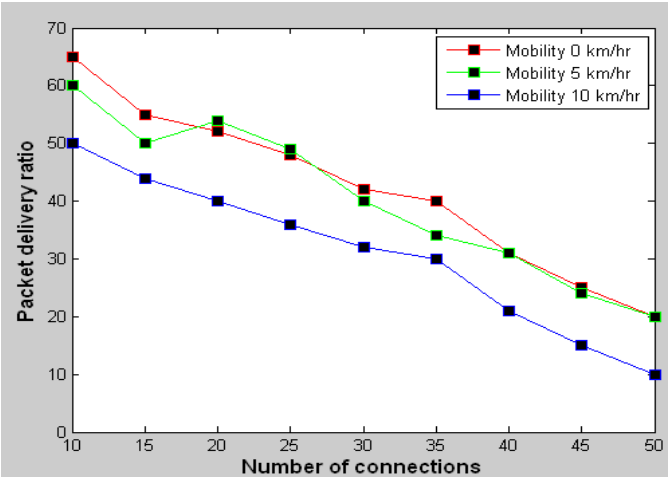

Fig. 6: Mobility at different scale

V. CONCLUSION

In this study, we considerthe back-off algorithm to enhance the performance of the network based upon IEEE 802.11 architecture. The basic idea that is used that is size of contention window control to increase the performance of network and remove the collision. .

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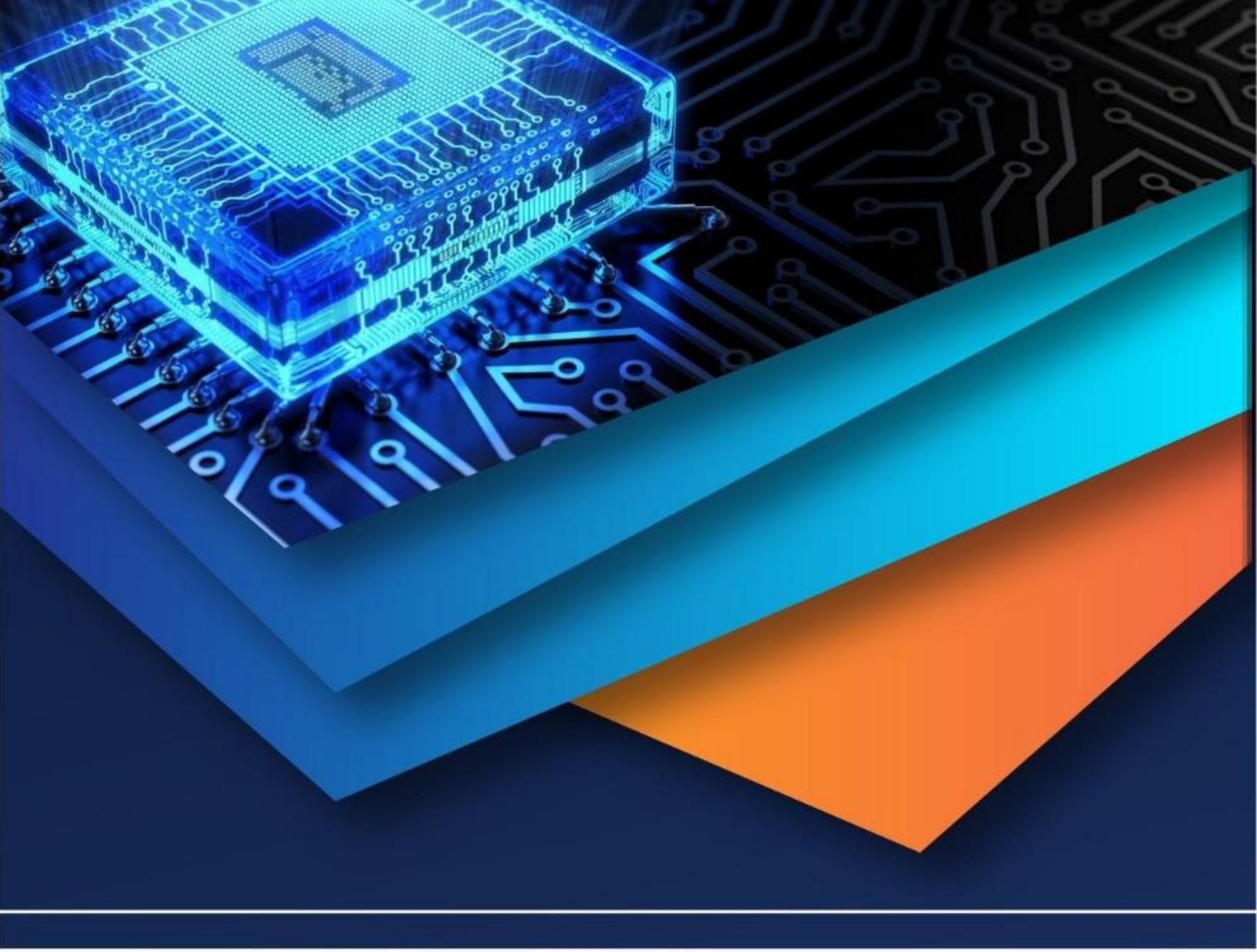

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