iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 **Issue:** V **Month of publication:** May 2017

DOI:

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

Volume 5 Issue V, May 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Review of MAC Protocol for WSN

[1] Er. Prabhnoor Bachhal [2], Er. Shivani Kwatra
[1]M.Tech(CSE Deptt), [2] Assistant Professor (CSE Deptt), GGGI, Dinarpur Ambala

Abstract: ***In this paper with the widespread rapid development of computers and the wireless communication, the mobile computing becomes the field of computer communications in high profile link. In wireless networks, the data is transmitted over the channel. Adhoc network is infrastructure less type of network in which nodes are moving. Due to movement of nodes the frequent changes are made in topology. CSMA/CA protocol is collision avoidance protocol and used for wireless networks. In this paper we studied adhoc network,MAC protocol ,design of issues in MAC protocol and CSMA/CD mechanism.***
Keywords: CSMA/CD,MAC,PCF,DCF,BSS.

I. INTRODUCTION

With the widespread rapid development of computers and the wireless communication,[1] the mobile computing becomes the field of computer communications in high profile link. To exchange information from one point to another communication is important. Wireless networks consist of nodes which communicate with each other over a wireless channel. Wireless communications networks are generally implemented and administered using radio communication. These wireless networks have various types like adhoc networks, sensor networks, cellular networks, satellite networks. The main focus is on adhoc networks. Adhoc network is a combination of wireless mobile nodes forming a wireless network. Adhoc network is infrastructure less type of network. Nodes in adhoc network act as routers that transmit data to desired destinations. Due to node mobility frequent changes are made in topology. Mobility of nodes in adhoc networks decreases the fair management of bandwidth and collision occurs when two nodes simultaneously transmit the data. In this type of network, nodes collision problem increases because all nodes are mobile and chances of collision are more. The network is said to be adhoc because it does not depend on a preexisting infrastructure, such as routers in wired networks or access point Iinfrastructure wireless networks. Network connectivity decides that which node forward data. Wireless mobile adhoc networks are useful in many areas which are as follows

A. Military Environments

1) Automated battlefield
2) Special operations
3) Homeland defense
4) Soldiers, tanks, plants

B. Civilian Environments

1) Disaster Recovery (flood, fire, earthquakes etc)
2) Law enforcement (crowd control)
3) Search and rescue in remote areas
4) Environment monitoring (sensors)
5) Space/planet exploration
6) Boats, small aircraft
7) Sports stadiums
8) Taxi cab network

C. Commercial[2]

1) Sport events, festivals, conventions
2) Patient monitoring
3) Adhoc collaborative computing (Bluetooth)
4) Sensors on cars (car navigation safety)
5) Vehicle to vehicle communication

Volume 5 Issue V, May 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

6) Video games at amusement parks

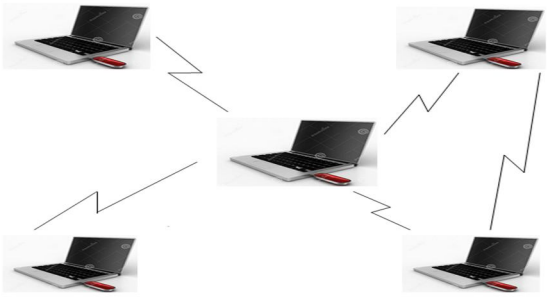


Figure1.1 Adhoc network

Wireless networks are different from wired networks. Adhoc wireless networks have specific properties such as node mobility, power constraints. For controlling access to the physical medium, new protocols are needed. The specific challenges of the adhoc networks make the design of media access control (MAC) more challenging.

II. MEDIUM ACCESS CONTROL (MAC) PROTOCOL

The medium access control layer is the lower sublayer of the data link layer of the seven layer OSI model. The main function of MAC protocol is to control the usage of the medium and this is done through a channel access mechanism. Channel access mechanism tells each node when it can transmit and when it is expected to receive data. The channel access mechanism is the main principle of the MAC protocol. MAC protocol defines multiple access protocols. Multiple access protocols are called random access protocols.

The MAC layer defined by IEEE 802.11standard is the lower part of the link layer and is placed between the dependent sublayer of the physical layer and LLC sublayer of the link layer. MAC architecture includes two basic coordination functions: Point Coordination Function (PCF) and Distributed Coordination Function (DCF). These functions define an operation mode for the stations that want to access the wireless medium. Coordination Function determines within a Basic Service Set (BSS), when a station is enabled to transmit and/or receive protocol data units at MAC level through the wireless channel.

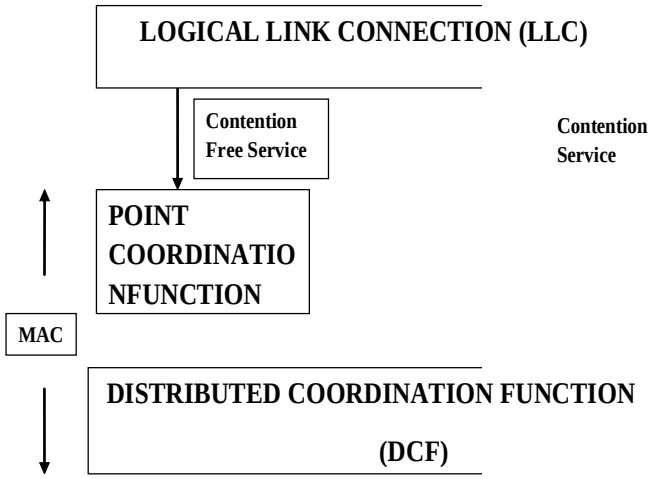


Figure1.2 IEEE 802.11 MAC Layer

DCF is a basic and compulsory mode for all stations and is located at lower part of MAC architecture. The DCF functionality is based on random techniques and is used by asynchronous traffic that does not require a severe bounded time. The IEEE 802.11 standard specifies the CSMA/CA access algorithm for this level. PCF is located over DCF and the access algorithm for this level[3] is based on circular polling from an access point, that is, deterministic access. This mechanism allows transmission of traffic that does not tolerate random and unbounded delays or contention free asynchronous traffic.

Volume 5 Issue V, May 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

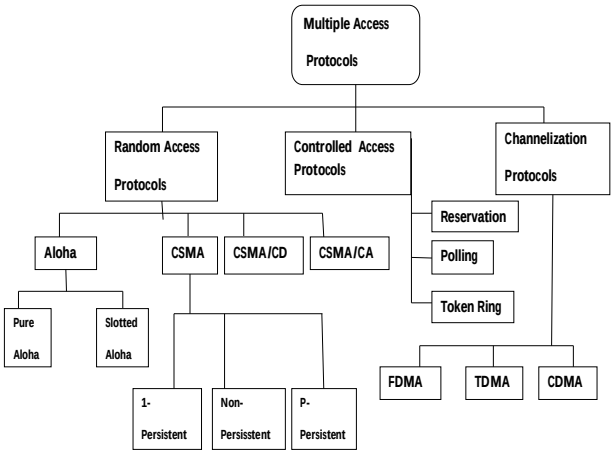


Figure2.1 MAC Protocols

A. Design Issues in MAC Protocol

When designing a MAC protocol following are the main issues that are to be considered:

1) *Bandwidth Efficiency:* The radio spectrum is limited so the bandwidth available[4] for communication is also very restricted. Bandwidth efficiency can be defined as the ratio of the bandwidth used for actual data transmission to the total available bandwidth. The MAC protocol must be intended in such a way that the scarce bandwidth is utilized in an efficient manner. The MAC protocol must try to maximize this bandwidth efficiency.
2) *Quality of Service Support:* Due to the implicit nature of the adhoc wireless network, where nodes are usually mobile most of the time, providing quality of service (QOS) support to data sessions in such networks is very difficult. Due to node mobility in adhoc networks, bandwidth reservation made at one point of time may become invalid. QOS support is essential for associate time-critical traffic sessions such as in military communications.
3) *Mobility of Nodes:* Nodes in an adhoc network are mobile. If the node mobility is very high, the bandwidth reservation made or the control information exchanged may end up being of no use.
4) *Synchronization:* Synchronization is very important for bandwidth reservation by nodes. The synchronization between nodes in the network must be considered. Exchange of control packets may be required for achieving time synchronization between nodes. The control packets must not consume too much of network bandwidth

B. CSMA/CA Mechanism

CSMA/CA protocol uses listen before talk mechanism and due to this mechanism collision is decreased and throughput is increased. The IEEE 802.11 standard determines DCF (Distributed Coordination Function) which is used for infrastructure less network. DCF is created on CSMA/CA protocol. It is variation of CSMA protocol. CSMA/CA uses RTS/CTS frames to avoid collisions.

1) *RTS:* Request to send frame, used by a node to transmit a frame.
2) *CTS:* Control to send frame indicated that the destination station is ready to receive data.
3) CSMA/CA algorithm is described as follows:
4) A source node wants to transmit a frame first senses the channel.
5) If channel is sensed to be idle then it send an RTS frame.
6) After receiving the RTS and waiting a short period of time, called Short Inter Frame Space (SIFS), the destination node sends a CTS frame.
7) If CTS frame is received then data is transmitted.
8) Destination node sends an acknowledgement after receiving the data.
9) If CTS is not received then wait for random backoff period.
10) In case if channel is not idle then it also waits for random backoff time.
11) Process is aborted after receiving data

III. LITERATURE REVIEW

A. Younus Muhammad, Haque A.K.M Fazlul, Md. Islam Zahirul in 2015[2]

Proposes the CSMA/CA protocol with RTS/CTS and without RTS/CTS. IEEE 802.11 uses CSMA/CA protocol that is collision avoidance protocol. It uses RTS/CTS frames to avoid collision. In CSMA/CA, protocol with RTS/CTS and without RTS/CTS is used. Two main parameters are considered: Average number of data packets, Number of nodes. Transmission and collision rate is carried out with RTS/CTS and without RTS/CTS. First nodes are taken >=5 then nodes are increases. The simulation is implemented in MATLAB.

B. HerzenJulien, Banchs Albert, ShneerVsevolod, Thiran Patrick in 2015[3]

Shows the comparison between time and frequency domain of CSMA/CA. Time and Frequency (TF) CSMA/CA is a simple extension of CSMA/CA protocol used by IEEE 802.11. TF CSAM/CA is distributed and it reacts only to packet collisions, successful transmissions and carrier sensing. TF-CSMA/CA is used in which an algorithm is used for flexible channelization that schedules packets in time and frequency domains. In TF-CSMA/CA, when collision occurs then back off also performs in time and frequency domains.

C. Md. ChowdhuryUddinMoin, Md. TanveerAsif, Md. UddinForkan in 2014[4]

Uses Multiple-Input Multiple-Output (MIMO) technology. Multiple-Input Multiple-Output (MIMO) technology is wireless technology that uses multiple antennas at transmitter and receiver to transfer multiple data streams at the same time. The performance of Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) multi user MIMO (MU-MIMO) uplink wireless local area networks (WLANs) is analysed. Here, analytical models are used to compute the throughput of each user and the total energy consumption in a WLAN with a single user MIMO (SU-MIMO) technique as well as MU-MIMO technique. Analytical model gives throughput, fairness and energy consumption performances for several WLAN scenarios

D. JiaZhaohan, He Xin, Li Y. Frank in 2014[5]

introduced beamforming into a co-channel concurrent transmission scheme. In CSMA/CA protocol when two nodes transmit at same time collision occurs and performance is reduced. To overcome this problem, concurrent transmission is used which facilitates simultaneous transmission of two or more stations under certain conditions and main is to improve channel utilization efficiency. In this paper beam forming is introduced into a co-channel concurrent transmission scheme and examine the benefits of concurrency with beam forming.

E. HammalYoucef, Othman Ben Jalel, Mokdad Lynda, AbdelliAbdelkrim in 2014

introduced a verification method of an enhanced version of CSMA/CA. In this paper, a formal modeling and verification method of an enhanced version of the CSMA/CA protocol corresponding to the IEEE 802.11 MAC layer, which has been introduced as the standard protocol for wireless local area networks (WLANs). Mainly DCF procedure of CSMA/CA protocol is used throughout a sequence of transmission steps. To capture the behavior of wireless stations implementing the DCF, UML state machine is used and it is translated into the input language of the UPPAAL model checker that is a network of communicating timed automata.

IV. CONCLUSION

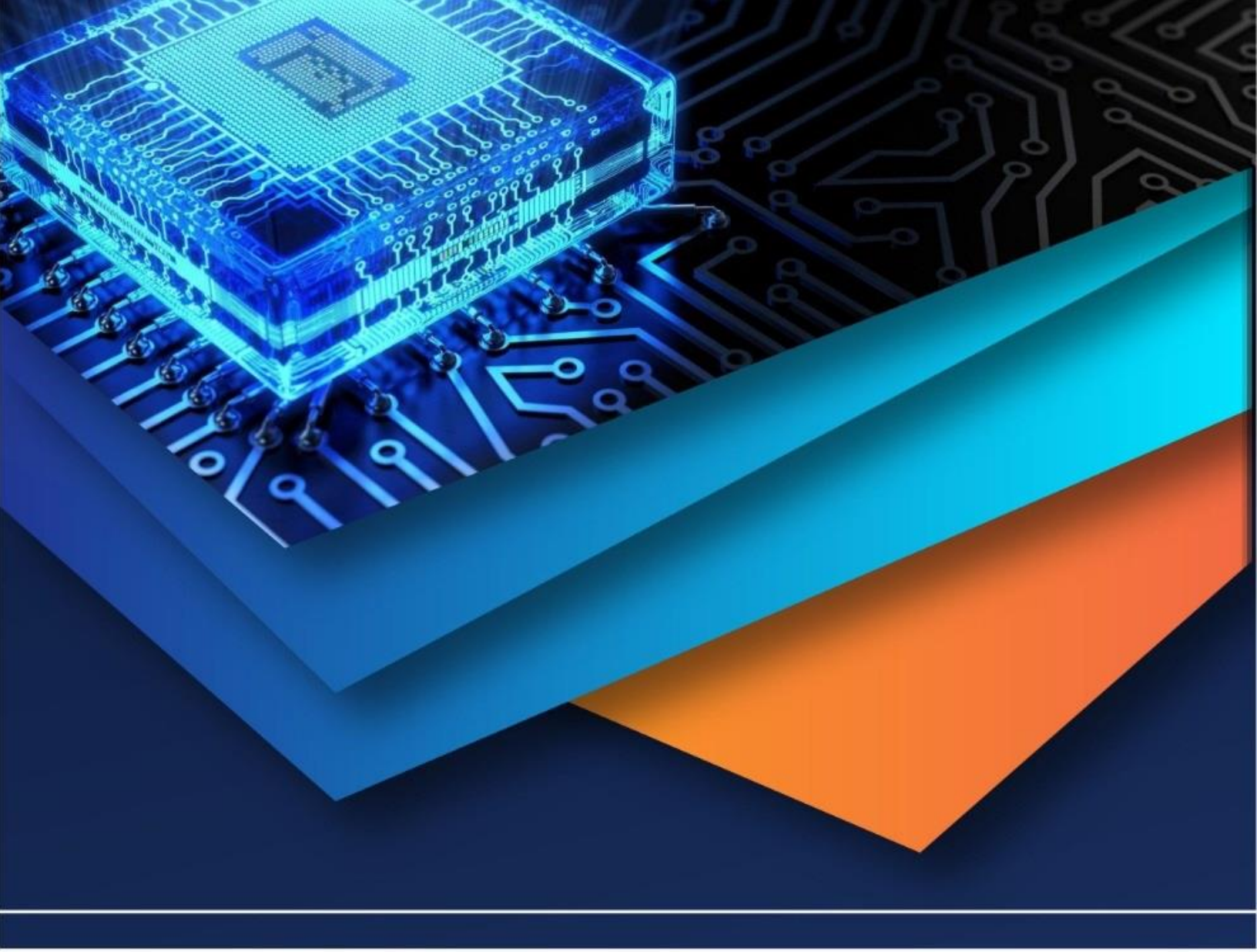
In this paper With the widespread rapid development of computers and the wireless communication, the mobile computing becomes the field of computer communications in high profile link. In wireless networks, the data is transmitted over the channel. Adhoc network is infrastructure less type of network in which nodes are moving. Due to movement of nodes the frequent changes are made in topology. CSMA/CA protocol is collision avoidance protocol and used for wireless networks. The problem arises when two transmitters transmit at the same time. To overcome the collision problem binary backoff algorithm is used. This algorithm reduces the chances of collision. With increasing the number of nodes the success rate, response time and hop count increases. So CSMA/CA is best used for hidden node problem. It increases the throughput and decrease the collision.

REFERENCES

[1] Andrew S. Tanenbaum, Computer Networks, Fourth Edition.: Pearson.
[2] A.K.M Fazlul Haque, Md. Zahirul Islam Younus, "Performance Analysis Of Csma/Ca In Wireless Local Area Network," International Journal Of Computer Applications, Pp. 43-48, 2015.
[3] Albert Banchs, Vsevolod Shneer, Patrick Thiran Julien Herzen, "Csma/Ca In Time And Frequency Domains," Ieee 23rd International Conference On Network

Volume 5 Issue V, May 2017
ISSN: 2321-9653

Protocols, Pp. 256-266, 2015.
[4] Md. Asif Tanveer, Md. Forkan Uddin Md. Moin Uddin Chowdhury, "Performance Analysis Of Csma/Ca Based Mu-Mimo Wlans," Ieee, Pp. 398-401, December 2014.
[5] Xin He, Frank Y. Li Zhaohan Jia, "Enable Concurrent Transmissions With Beamforming For Broadband Wireless Access In Csma/Ca-Based Wlans," Ieee, Pp. 1075-1080, 2014.
[6] Vinod Maid Dr. Vinod Pachghare, "Contention Based Fair Scheduling Protocol For Wireless Lan," Paripex - Indian Journal Of Research, Pp. 176-179, 2013.
[7] S. Naveen C. Ellammal, "Issues In Medium Access Control Protocol For Wireless Ad Hoc Networks," International Journal Of Advanced Computing, Engineering And Application (Ijacea), Vol. 1, No. 3, Pp. 115-122, December 2012
[8] Prof. Dinesh Chandra Jain Ms. Ritu Patidar, "Solving The Hidden Terminal Problems Using Directional-Antenna Based Mac Protocol For Wireless Adhoc Networks," International Journal Of Advanced Research In Computer Science And Software Engineering, Vol. 2, No. 5, Pp. 125-130, May 2012.
[9] J. P. Saini Shiva Prakash, "A Review Of Energy Efficient Routing Protocols For Mobile Ad Hoc Wireless Networks," International Journal Of Computer Information Systems, Vol. 1, No. 4, Pp. 36 0f 73 - 46 0f 73, 2010.
[10] B.S. Manoj C. Siva Ram Murthy, Ad Hoc Wireless Networks: Architectures And Protocols. Prentice Hall, Usa: Pearson, 2004.
[11] Koushik Kar Xin Wang, "Throughput Modelling And Fairness Issues In Csma/Ca Based Ad-Hoc Networks," Ieee, Vol. 1, Pp. 23-34, 2005



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY