Volume 4, Issue 4, April 2014 ISSN: 2277 128X

International Journal of Advanced Research in Computer Science and Software Engineering

Research Paper

Available online at: www.ijarcsse.com

Efficiency Resources in Mac Protocol for Ad Hoc Network

Mayank Sharma
Computer Science and Engineering
M. Tech Scholar, JECRC University
Jaipur, India

Sunita Gupta
Computer Science and Engineering
Assistant Professor, JECRC University
Jaipur, India

Abstract: Bandwidth, power and collision are considered as three important resources in wireless networks. Therefore, how to manage these resources becomes effect on wireless ad hoc network. These effects are not present in wire line networks, and evaluation of available bandwidth in wireless networks a difficult task. Furthermore, in wireless medium the available resources also vary with the protocol and its central network i.e. ad hoc network. Therefore, how to increase a MAC protocol to improve the bandwidth efficiency and decrease the energy utilization is necessary. In this paper, a collision-aware spectrum assignment scheme has been proposed for Bandwidth Optical Networks allocates the available bandwidth and increases energy efficiency in multi hop collection networks compared to the traditionally used random back off. In this paper, we discuss the MAC protocols with details about the bandwidth, power and collision used and their limitations.

Keywords— Distributed Computing Architecture (DCA), Medium Access control (MAC), Frequency Division Multiplexing (FDM), Frequency division duplex (FDD), Frequency-domain on-off collection transmission (FD-OOAT)

I. INTRODUCTION

WLANs are commonly used in recent period, such as university grounds, property, hotels, and airports used for internet access. However, limited resources (e.g., bandwidth, energy, power) control the usage of WLANs. Recently, Wireless networking offers new prospect and challenges for wireless ad hoc network. In the absence of wireless network, allocated group of communication nodes set up and maintain a network among them selves, without maintaining a base station or a central control of ad hoc network. Further, when the number of stations and the traffic load enhance, the possibility of a successful communication will corrupt and transmission collisions will swell. Transmission collisions may outcome in the waste of bandwidth and the utilization of energy. Therefore, how to increase a MAC protocol to improve the bandwidth efficiency and decrease the energy utilization is necessary. In the reference model, medium access is a function of the layer2 sub layer called MAC (medium access control). MAC protocol has a limited capacity of bandwidth. It is used for Wireless service. It is unique to recognizer establish network interface for spell out physical network area. These protocols is needed to provide the energy efficiency, communication links, power control, bandwidth utilization, address the hidden-terminal problem and expose-terminal problems.

However, the MAC is utilizing in link layer, the channel is easy to access by the CSMA/CD scheme. All channels to establish the channels' situation and avoid collision, in the process of the frame duration access the TDMA, i.e. time slots are required in frame duration, and FDMA (Scheduled protocol) access the bandwidth allocation which every node gets a permanent allocation of bandwidth.

The aim of this latter is to initiate multiple channels in medium for FDMA, which constrain the collision of number of channel N) and utilized bandwidth (W).

II. RELATED WORK

The Current MAC layer designs for ad hoc network proposed this advantage of MAC protocol:

1. collision declaration
2. constancy
3. hidden node explanation
4. Fairness
5. Energy efficient

Bandwidth reservation in wireless networks is a very difficult task due to the volatility of collision between channels, radio channels, node mobility and need of synchronization between nodes. FDMA-based bandwidth efficiency better performance with MAC protocol that implies available bandwidth (w), divided between the relaying channels of access medium. Unlike several protocols for all nodes of frequency similarly with respect to bandwidth conservation, our protocol based over the period.

In [1] TDMA design, the node's time slots get exhaust when it does not have to transfer relay. These are potentially better suitable to network with heavy and unbalance load. Bandwidth conserve between the channel medium consume the

mechanism of Power Efficient MAC. Besides fully network, the channel bandwidth shared in each node of MAC protocol because all nodes distributed with priorities.

In [4] multichannel ad hoc network nodes might breathe more on different channel, as outcome node not receives broadcast information. The receiver problem occur new issue in multichannel network. When nodes are, synchronize then problem in either transmitting or receiving. Thus, the busy receiver problem increases the reducing rate of packet and desecrates the channel of bandwidth. When the number of channel or traffic load is increase then collision is increases that is results in waste of bandwidth and consume energy. Therefore, how to developed bandwidth efficiency in MAC protocol [2]. The key factor of Bandwidth efficiency proposed of MAC for ad hoc i.e. in the way is utilizing the available medium. Suppose a frequent channel for all station further efficient use of the medium it means the channel separation way to access capable bandwidth.

III. PROPOSED MAC PROTOCOL: BASIC SCHEME

Such a network may be managed by individual or be associated to the larger Internet. Ad hoc network architecture has various benefits, such as traffic distribution, power consumption, heavy load balancing, bandwidth utilization and self-reconfiguration. However, those benefits come with loads of challenges. New advance technology integrated to truly flexible and decentralized network. In term of advance technology design a MAC (medium access control) protocol used communication medium to resolution the collision of channel. When using the MAC protocols proposed for wireless ad hoc networks, we identify single-channel MAC protocols. These protocols support the broadcast because some channel use routing protocol such as broadcast information.

The IEEE 802.11 broadly accepted based on the single-channel model. Due to higher collision between medium the network performance will disgrace speedily as the number of nodes increase. Advance technology of MAC i.e. multichannel MAC protocol one approach of collisions problem. Both channel introduced the hidden terminal and expose terminal problem because channel collision and reduced channel utilization. Overcome of this problem to propose the DCA protocol. Protocol express in channel model generally bandwidth separated by N data channels (D1, D2… Dn) and one control channel that based on a FDMA model.

Applications:

Applied to wireless ad hoc network over the existing wireless medium access protocols can improve bandwidth use, power consumption, effect on collision between numbers of channels and provide quality of service support to different medium access.

A. Bandwidth Efficiency:

In medium access control, (MAC) protocol developed for high bandwidth wireless networks, such as based on FDMA. In common, the invention provides MAC in a communication network, which includes number of channel over a shared communication medium. The network time separated in TDMA frames, every one containing a fixed number of time slots. Therefore, the cycle duration is fixed and entire network synchronized on frame and slot. Be MAC Protocol provides bandwidth provision for the delivery of network control messages and recognizes maintenance of network. Bandwidth is depending on many telephony applications. It is the frequency range taken by modulated carrier wave form in radio communication. Its refers to **[3]** baseband bandwidth in the context of Nyquist sampling rate theorem, while pass band bandwidth in the context of Nyquist symbol rate or Shannon-Hartley channel capacity for communication systems. Nyquist filters have the property that their impulse response rings at the symbol rate. The filter is chosen to ring, or have the impulse response of the filter cross through zero, at the symbol clock frequency.

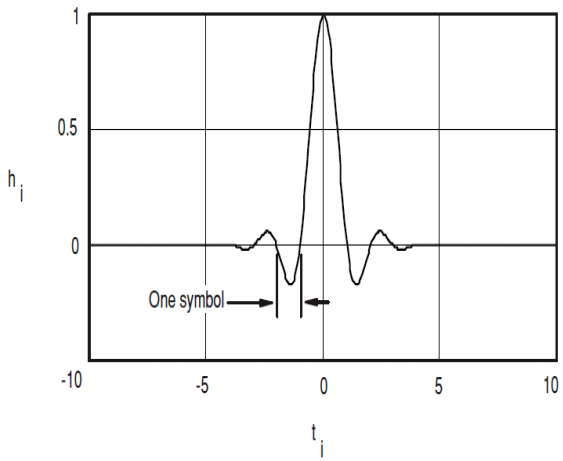

Figure 1: Nyquit rate filter [3]

According to Shannon's notion of entropy, capacity per unit time (or achievable rate) C, expressed in bits per second, for an additive Gaussian noise link is given as C = W.log_2 (1 + (S / N)), where W is the available bandwidth, S is the

received signal power, and N = W$N_0$is the received noise power. The receiver spectral noise density N_0 assumed constant over the herein considered frequency range. According to sampling theorem the signal bandwidth in hertz refers to the frequency range in which the signal's spectral density (in W/Hz or V^2/Hz) is nonzero or above a small threshold value. It used in calculation of the lowest sampling rate.

In FDMA is channelization protocol in medium access, which gives the personal allotment of single or multiple channels or frequency band by users. In medium FDMA is different form FDD and FDM.

2

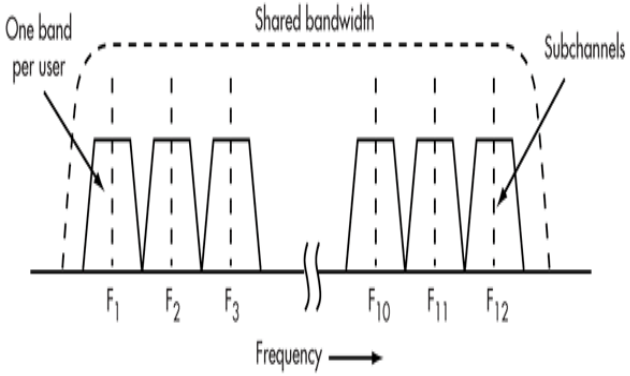

Figure 2: FDMA divides the shared medium bandwidth into individual channels. Subcarriers modulated by the information to be transmitter occupy each sub channel.

FDD refers the uplink and downlink frequency shared between channels, on the other hand, transmission system access to allow various users in FDMA. While FDM refer, physical layer that transmits channels low-bandwidth to high-bandwidth.

B. Energy Efficiency:

Studies about ad hoc network are self-organization and adaptive collection of device, which is detected automatically and join with wireless link. In the scenario, automatically reconfigure of the node when the node moves out of network area. There are two types of classification of architecture (1) flat and (2) hierarchical. Every node of ad hoc network complete of power resource, which is used in term of size, processing, transmission between channels. In the ad hoc network, transmission power would be links between the bi-directional on the other hand sometime it gives rise to unidirectional, which is solved by the MAC protocol. In terms of applications, ad hoc networks suggest the required flexibility to adjust to positions were no sort of infrastructure is accessible.

Reason of Energy Wastage:

1) Collision between channels.
2) Packet overhead i.e. not control on the sending data.
3) Transmission of packet at the same time in the medium.
4) Idle leasing, overhearing.
5) Trans receiver is standby mode i.e. switch off.
6) Over emitting, because the destination node is not ready for receive the message.

Advantage of Energy:

1) Better performance
2) Lower ownership cost
3) Environmental protection

The prevention of energy wastage design MAC protocol a scenario of massaging.

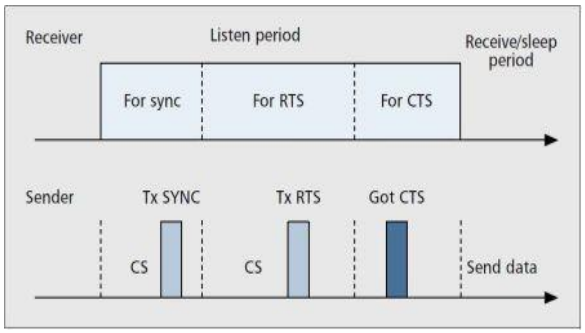

Figure 3: Message transmission scenario *[4]*

Encryption process of energy improves:

Encryption is a process of exchange data from original form to encrypted form that is not understands by illegal user. Data encryption is used for data securely transmit over an insecure channel. In this transformation, a mathematical method is very complex to undo the transmission so we use a key, which is judge a large number in minimum time and control the encryption and decryption. A symmetric key algorithm utilizes the similar key to encrypt and decrypt the data. An asymmetric key algorithm utilize two different but related keys where one is used to encrypt and the other is used to decrypt the data.

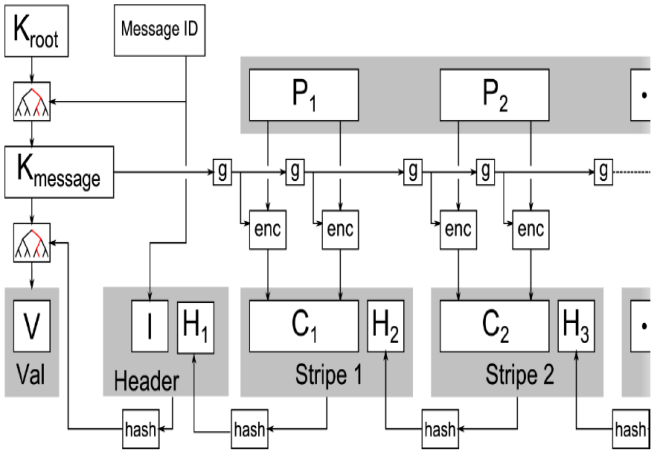

Figure 4: Encryption process *[13]*

C. Collision Efficiency:

The collision theory is states that in the medium frame impact to break the channel of medium from all new channels i.e. in the medium successful changes are called successful collisions. Collisions have sufficient energy also known as activation energy. Where two or more channel share the same medium then collision detection is easy in wired LANs because its evaluate single strength and compare transmit and received signal link. However,

3

difficult in wireless LANs signal of distributed transmitter overwhelm another signal at the recipient receiver.

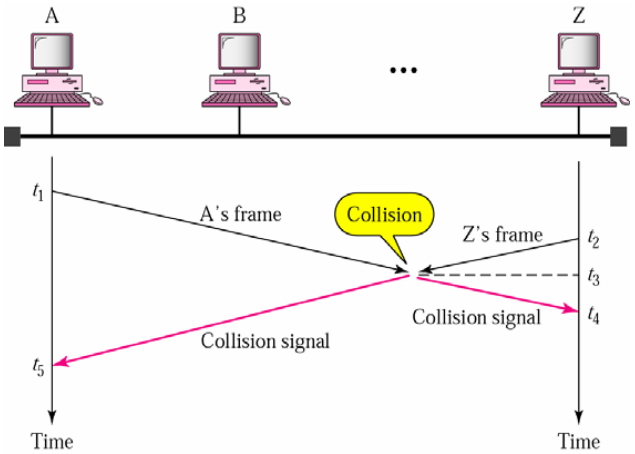

Figure 5: Collision detection between frames

Reason of collisions:

1) Multichannel expose terminal problem
2) Data packet transmission
3) Traffic load Scalability
4) Cost effective medium
5) Shared channel
6) Timing

Effects:

1) Data reduce in transmission
2) Collision overhead
3) Time wastage
4) Cost high
5) Delay

How to manage collisions?

When same type of two wireless waves with same frequency (i.e. in same channel) intercept in mid air then collision occurs. Colliding signal is corrupted to each other. The probability of collisions only as a wired network must deal with wireless network. However, the devices on the wireless network have no capability to determine if a collision has actually taken place.

In Mac, organization proposed for the up-links of broadband wireless networks with asynchronous manipulators. A FD-OOAT scheme has achieved a collection tolerance, where a large number of orthogonal sub channel is divided by spectrums, and every symbol is transmitted over a little subset of the sub-channels to decrease collisions. The future scheme, however, can operate with asynchronous users. A modern principal framework is confirmed to study the effects of time-domain user delays on system execution. In CSMA/CA, all 802.11 devices are half-duplex in nature and thus cannot listen and transmit at the same time. The devices must attempt to avoid collisions together due to these design criteria i.e. It should not create combination for collisions. The various frequency bands and combination with the different standards can be confusing which is used for available channels.

How to Detect Collision?

To detect collision different types of Physical simulators are used which differ in the way they react on a collision. Collision can be detected by using the softness of the material to calculate a force, which can resolve the collision in the time steps but it is very CPU intensive because of softness. Some simulators estimate the time of collision by linear interpolation, roll back the simulation.

Some simulators use the Newton's method of linear interpolation to calculate the time of collision with a much higher precision than the rest of the simulation. Collision detection utilizes time coherence to allow even finer time steps without much increasing CPU demand, such as in air traffic control. When two or more devices attempt to send a signal along the same channel at the same time, the resultant collision is generally a garbled message. When collisions occur, all computer networks require some sort of mechanism either to prevent it or to recover it.

In networks, a node determines that a collision has occurred from the process. Collisions follow networks, which a protocol needs to recover from such events. Ethernet uses CSMA/CD for collision detection and recovery in medium.

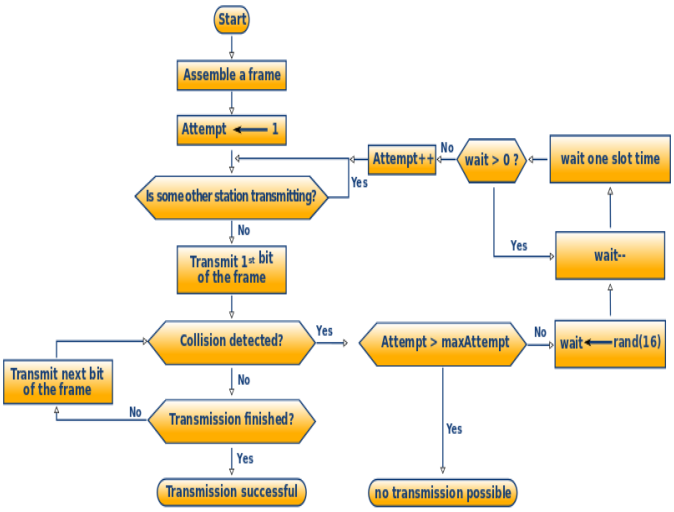

Figure 6: Collision detect process

Collision detection procedure:

1) Continue transmission (with a jam signal instead of frame header/data/CRC) until minimum packet time is reached to ensure that all receivers detect the collision.
2) Increment retransmission counter.
3) Was the maximum number of transmission attempts reached? If so, abort transmission.
4) Calculate and wait random back off period based on number of collisions.
5) Re-enter main procedure at stage 1.

4

IV. CONCLUSION

This paper presented a broad overview of the review/research work shown in the field of ad hoc wireless networks with respect to MAC protocols. We have discussed various schemes and their salient features. In particular, we have looked at issues of bandwidth efficiency, collision resolution and power conservation. We have discussed due to the network environment of bandwidth arrangement, it may not be utilize all the time. When the bandwidth request in each frame then the unused bandwidth occurs in present frame cannot be use by existing bandwidth it has adjusted as in next coming frame.

In Power control, the system throughput, capacity, reduce latency and battery time are probably to increase but some time its design may produce the incorrect result. The design of power control is vastly dependent on the system topology but

without having a design mechanism to adapt to different network topologies, so it is hard to simplify a given power control is effective or not. Ad hoc network have a most advantage of power control.

FDMA is another scheme that offers a collision free medium, but it requires additional channel to communicate with different medium channels. Due to short medium range channel cannot support wide area but in wide area, collision control is more frequent and difficult so the design of protocol provides flexibility, performance and scalable for all high load and wide area situation.

REFERENCES

[1] Schiller J., *"Mobile Communications"*, Pearson education limited, Edinburgh Gate, Harlow, Forth edition (2009).

[2] Manoj B., Murthy C., *"Ad Hoc Wireless Networks Architectures and Protocols"*, PrenticeHall, Upper Saddle River, New Jersey, Sixth edition (2008).

[3] Kannan R., Kalidindi R., Iyengar S., *"Energy and Rate based MAC Protocol for Wireless Sensor Networks"*, Department of Computer Science Louisiana State University Baton Rouge, LA, 32 (4), 12-4, (2003).

[4] Shih K., Chang C., Chou C., *"A Power Saving MAC Protocol by Increasing Spatial Reuse for IEEE 802.11 Ad Hoc WLANs"*, Department of Computer Science and Information Engineering Tamkang University, Tamshui 251, Taipei, Taiwan, 3-24, (2010).

[5] Dohler M., Gkelias A., *"Resource Allocation for FDMA-Based Regenerative Multihop Links"*, IEEE Transitions on wireless communications, 3(6) 11,(2004).

[6] Suman B., Sharma S., Pant M., *"Bandwidth efficient medium access protocol for tactical MANET waveform"*, International Journal of Engineering Research and Applications (IJERA), 2(3) 5-6,(2012).

[7] S. Hayat, N. Javaid, Z. A. Khan§, A. Shareef, A. Mahmood, S. H. Bouk, *"Energy Efficient MAC Protocols"*.
   a. Department of Electrical Engineering, COMSATS.
   b. Institute of Information Technology, Islamabad, Pakistan.
   c. Faculty of Engineering, Dalhousie University, Halifax, Canada.

[8] Paul J.M. Havinga& Gerard J.M. Smit, *"Energy-efficient TDMA Medium Access Controlprotocol scheduling"* University of Twente. Department of Computer ScienceEnschede, the Netherlands. {havinga, smit}@ cs.utwente.nl

[9] IlkerDemirkol, CemErsoy, and FatihAlagöz "MAC Protocols for Wireless Sensor. Networks: A Survey", Bogazici University. Sunil Kumar* a, Vineet S. Raghavan b, Jing Deng c *"Medium Access Control protocols for ad hoc wireless networks: A survey"*.
   a. Department of Electrical and Computer Engineering, Clarkson University, Potsdam, NY 13699, United States.
   b. Digital Television Group, ATI Technologies Inc., Marlborough, MA 01752, United States.
   c. Department of Computer Science, University of New Orleans, New Orleans, LA 70148, United States Received 17 October 2003; received in revised form 13 September 2004; accepted 8 October 2004.

[10] Khaled H. Almotairi and Xuemin (Sherman) Shen*, *"Multichannel medium access control for ad hoc wireless network"*, Department of Electrical and Computer Engineering, University of Waterloo, waterloo, ON N2L 3G1, Canada.

[11] Raja Jurdak, Cristina Lopes, and Pierre Baldi, "A survey, Classification and Comparative Analysis of MAC Protocol for Ad hoc network", University of California, Irvine.

[12] Paul C.Kocher, Joshua Jaffe, Benjamin Jun, PankajRohatgi, *"Introduction to differential power analysis"*, Journal of Cryptographic Engineering.

