International Journal of Current Engineering and Technology
E-ISSN 2277 – 4106, P-ISSN 2347 - 5161

Available at http://inpressco.com/category/ijcet

Research Article

An Adaptive MAC Protocol with Control Overhead and Dynamic Slot Allocation Technique for WSN

Ali Majid Muhommed[Á*], Mukesh Kumar[Á], A.K.Jaiswal[Á] and Rohini Saxena[Á]

[Á]Iraqi Ministry of Education, General Directorate of Vocational Education, Dept. of ECE, Shiats/Allahabad, India

Accepted 20 Sept 2014, Available online 01 Oct 2014, **Vol.4, No.5 (Oct 2014)**

Abstract

Reducing the delay is one the most challenges within the Wireless sensor Networks. planning of the medium access management plays a very important role in enhancing the performance of wireless detector networks. In Sleep/wake up planning technique, nodes square measure operational during a low duty cycle and scale back finish to finish delay so save energy and extend the network life. I-MAC that involves the assignment of slots for every packet, wake up-sleep planning once combined with cross layer optimization would effectively scale back the tip to finish delay and thereby ensures energy economical operation. Supported optimum energy flow at the cross layer the frame length may well be revised and by this slots may well be reused by TDMA planning.

Keywords: *Wireless sensor network; End to End delay; Sleep/wake up scheduling; cross layer optimization*.

1. Introduction

Wireless sensing element networks carries with it variety of sensors that area unit deployed densely and every which way. sensing element nodes area unit less weight and low value with the aptitude of sensing, process and transmission sensing element nodes area unit restricted by the battery power impractical to charge or replace the exhausted battery, that results in restricted lifespan of a sensing element network. Increasing the network lifespan is that the common objective of sensing element network analysis. Style of a raincoat layer protocol for wireless sensing element network could be a difficult task because of restricted battery power and restricted information measure (Arifuzzaman.M *et al*, 2013). TDMA protocols cut back information retransmissions as a result of collision doesn't occur in TDMA protocol (Jayanthi K. Murthy *et al*, 2012). Additionally to energy potency, quality of service (QoS) metrics like end-to-end delay has to be taken into consideration in some applications or beneath bound situations, for example, delivering time period information (Liqi Shi *et al*, 2010). Main objective of our paper is minimizing network wide energy consumption and additionally cut back end-to-end delay for increasing the lifespan of the network. Cross layer optimization and minimum delay programming victimization Intelligence hybrid raincoat (I-MAC) to attain link responsibility, high rate and cut back finish to finish delay in WSN.

2. Related Work

In wireless sensing element network, the authors of (Ye.W *et al*, 2004) acquire one among the new works in competition based mostly mackintosh protocol. S-MAC nodes operate in low duty cycle and energy potency is achieved by periodic sleeping. The author of (Van Dam.T *et al*, 2003) improves the energy potency of S-MAC by adjective duty cycle. T-MAC reduces the idle listening by sending all messages in burst of variable length associated sleeping between bursts and maintains an best active time below variable load by sky-high determinative its length. The authors of (Polstre.J *et al*, 2004) think about mackintosh for Mica2. B-MAC enable associate application to execute its own mackintosh through a well-defined interface conjointly adopt Low power listening and engineer the clear channel sensing technique to boost channel utilization. The authors of (Jayanthi K. Murthy *et al*, 2012) think about the amount of packets being sent at each node and supply associate algorithmic rule to get the shortest schedules by eliminating the nodes while not packets to send at every loop, these algorithms need world topology data, which can be tough for big size networks. Interference-free TDMA schedules are calculated in (Cui.S *et al*, 2007) for a small-scale network by joint optimization of the physical, MAC, and network layers. The authors use convex optimization to resolve the cross-layer-based network period optimization downside, using the inside purpose method.

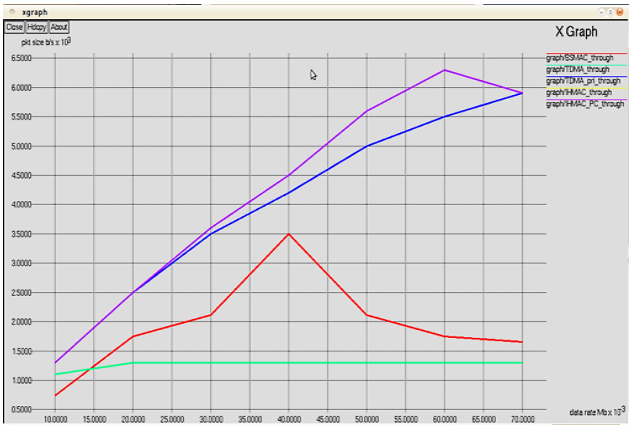
3. System Analysis

Existing system & demerits

Z-MAC has the setup phase. In setup phase there are neighbor discovery, slot assignment, local frame exchange and global time synchronization steps has been done. These operations run only once during the setup phase. Q-MAC scheme that provides quality of service by Differentiating network services based on priority levels.

*Corresponding author: **Ali Majid Muhommed**

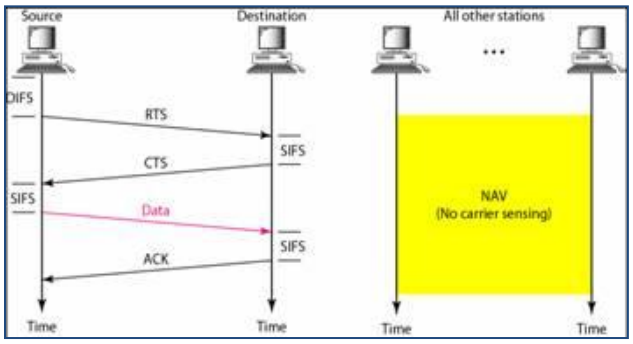
The priority levels reflect the criticality of data packets originating from different sensor nodes.



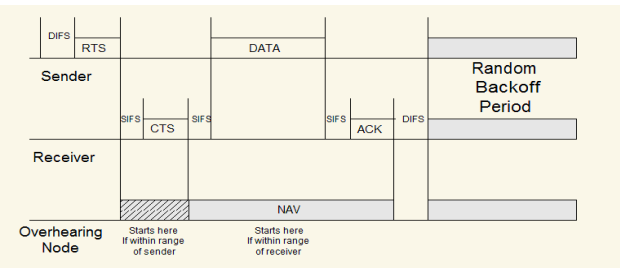
Proposed system

The IH-MAC does it by using the strength of CSMA and TDMA approach with intelligence. The novel idea behind the IH-MAC is that it uses both the broadcast scheduling and link scheduling. IH-MAC classifies packets according to their importance and stored the packets into the appropriate queue. The source node knows the degree of importance of the sensed data and accordingly the application layer sets the priority.

Working Model of CSMA

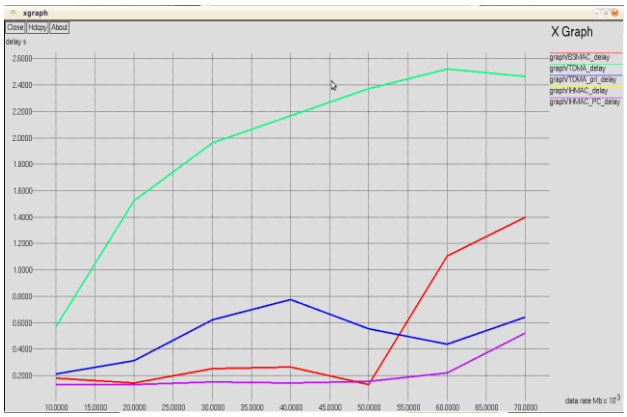


Distributed coordination function (DCF) is the fundamental MAC technique of the IEEE 802.11 based WLAN standard. DCF employs a CSMA/CA with binary exponential back-off algorithm.

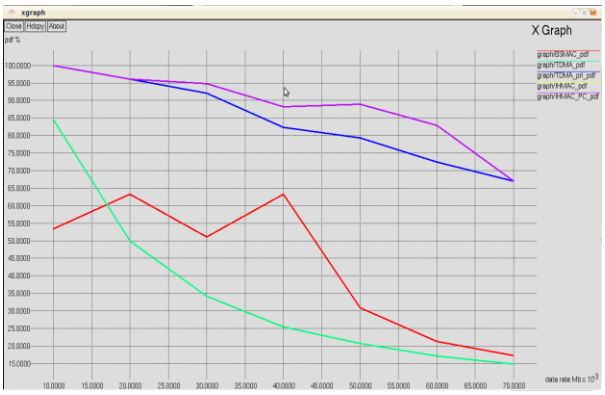


When a station sends an RTS frame, it includes the duration of time that it needs to occupy the channel. The stations that are affected by this transmission create a timer called a network allocation vector (NAV) that shows how much time must pass before these stations are allowed to check the channel for idleness. Each time a station accesses the system and sends an RTS frame, other stations start their NAV. In other words, each station, before sensing the physical medium to see if it is idle, first checks its NAV to see if it has expired

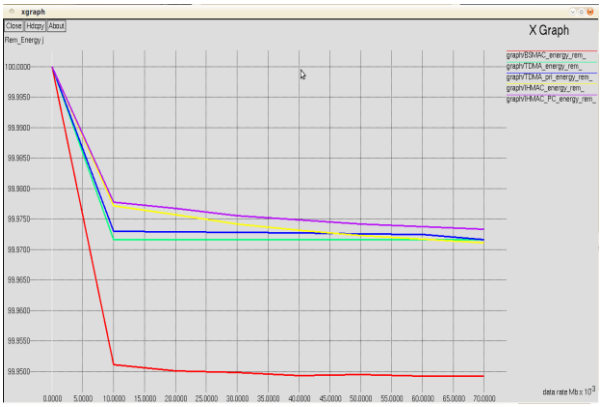
Throughput Comparison



Delay Comparison



PDF Comparison



Energy Comparison

Conclusion

This paper presents a novel energy efficient hybrid based medium access control protocol for wireless sensor networks. There are three novel contributions in this

paper. Firstly, our proposed protocol introduces the use of the concept of link scheduling and broadcast scheduling together. We successfully identified (and achieved) the possibility of enhancement of the scope of parallel transmission by transmitting a signal (wireless) with the appropriate power (adjusted power). Another contribution is the introducing the idea and realization of a decentralized TDMA. We successfully showed that without any centralized scheduling how TDMA can run smoothly. Simulation results also shows that our method shows the better performance when compared with the existing methods.

References

Arifuzzaman.M., and Matsumoto.M. (June. 2013), An Intelligent hybrid MAC with Traffic-Differentiation-Based QoS for wireless sensor network, in. IEEE Sensors Journal, vol. 13, no 6.

Liqi Shi, and Abraham.O.,Fapojuwo (July 2010), TDMA Scheduling with Optimized Energy Efficiency and Minimum Delay in Clustered Wireless Sensor Networks, IEEE Transaction on Mobile Computing, pp. 927-939.

Jayanthi K. Murthy (June 2012), Suthikshn Kumar and Srinivas A. Energy Efficient scheduling in cross layer Optimized Clustered Wireless Sensor Networks International Journal of Computer Science and Communication vol.3, no. 1, pp. 149-153.

Arifuzzaman.M., and Matsumoto. (2012), An Efficient Medium Access Control Protocol with Parallel Transmission in Wireless Sensor Networks, Journal of Sensor Actuator Networks, vol.1, no.2, pp. 111–122.

Rhee. I., Warrier. A., Aia.M., and Min.J. (2005.), Z-MAC: A hybrid MAC for wireless sensor networks, ThirdInternational Conference Embedded Network Sensor System.

Li. J., and Lazarou.G.Y. (2004), A bit-map-assisted energy efficient MAC scheme for wireless sensor networks, in Proc. 3rd Int. Symp. Inf. Process. Sensor Netw., New York, USA, pp. 55–60.

Ye.W., Heidemann.J., and Estrin. D. (June 2004.), Medium access control with coordinated adaptive sleeping for wireless sensor networks, in Proc. IEEE/ACM Trans. Netw., vol. 12, no. 3, pp. 493–506.

Van Dam.T., and Langendoen.K. (2003), An adaptive energy-efficient MAC protocol for wireless sensor networks, in Proc. 1st Int. Conf. Embedded Netw. Sensor Syst., pp.171–180.

Polstre.J., Hill. J., and Culler.D. (2004), Versatile low power media access for wireless sensor networks, in Proc. 2nd Int. Conf. Embedded Netw. Sensor Syst., New York, USA, pp. 95–107.

Cui.S., Madan.R., Goldsmith.A.J., and Lallm.S. (Oct. 2007), Cross-Layer Energy and Delay Optimization in Small-Scale Sensor Networks, IEEE Trans. Wireless Comm., vol. 6, no. 10, pp. 3688-3699.

Ali Majid Muhammed received his bachelor of Electronics and Communication Engineering Technical Najaf collage from Iraq in 2007and his M. Tech in communication system engineering in Department of Electronics& communication engineering in SHIATS, Allahabad.

Mukesh Kumar is working as Asst. Prof.in the Department of Electronics & Communication Engineering in SHIATS, Allahabad.He received his M.Tech. Degree in Advanced Communicating from SHIATS, Allahabad in 2010. His research is focused on Signal processing and Microwave Engineering.

Prof. Aravind Kumar Jaiswal is working as Head of the Department in the Department of Electronics &Communication Engineering in SHIATS, Allahabad. He received his M.Sc (Tech) Degree in Electronics & Radio Engineering in theyear1967 from University of Allahabad. His research is focused on Optical Wireless Network, Advanced Communication Systems, Antenna & Wave Propagation, Optical Fiber Communication and Control System.

Rohini Saxena is working as Asst. Prof. in the Department Electronics & Communication Engineering in SHIATS, Allahabad. She received her M.Tech. Degree in Advanced Communication System Engineering from SHIATS, Allahabad in 2009. Her research is focused on, Microwave Engineering, Signal Processing, Computer Networks and Mobile Communication