Wireless Sensor Network With Csma/Static/Mobile Nodes

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Abstract: In Wireless sensor networks the major requirement is low power consumption of the sensor node system. This paper represents an analysis of the performance of low power multiple access protocols designed for a wireless sensor network. In this paper, low power consumption of CSMA protocol was observed using various types modulation such as MSK and OQPSK. Experiment is performed for 802.15.4 physical layer energy consumption with modulation type (MSK & OQPSK16).
Keywords: CSMA, MSK, OQPSK WSN

I. INTRODUCTION

Wireless sensor network is a large web of sensor devices and a gateway (to send information globally on internet) which is commonly known as sink. WSN have a wide range of applications such as target detection and tracking, environmental monitoring, and tactical systems and many commercial applications. WSN consist of sensor nodes which are capable of actuating, sensing, relaying and storing the collected information, have made remarkable impact in automation and transportation that represent smart environments. Innovations in industrial, home and Data for smart environments are obtained through WSN consist of sensors that are operating in different modes at different locations, a sensor network is capable of processing, sensing, storing and communicating which helps the base station to observe and react according to the environment wireless sensor networks are constrained by scalability, cost, topology change and power are being devised to overcome these and to make sensor networks an integral part of our lives[1]. For efficient transmitting of packets from transmitter protocol is highlighted. In a Medium Access Control (MAC) protocol coordinates works over a shared channel. The solutions that are most commonly used are contention-based. The general contention-based strategy for a node that has a particular message that can be transmitted for testing the channel whether it is busy or not then the receiver use the protocols. In which Mac transmits the message, if the channel is busy then it will wait and tries again. After collision, nodes will wait for random amount of time and try to avoid collision again. At the same time if there are two or more nodes then there is a collision and the nodes colliding try again later. Dozen modes is also present in many Mac Protocols where sending or receiving of packets stops and saves energy by going to the sleep mode in a given time-frame. For avoiding collision and detecting collision we use CSMA. Carrier sense multiple access/collision avoidance (CSMA/CA) is a multiple access method implemented in wireless networks for sensing the collisions and avoiding them from occurring. For efficient use of wireless channels among multiple nodes, CSMA/CA relies on the random deferment of packets. This class of MAC protocols is one of the most popular for ad hoc networks. A network can be defined as a connection between communicating devices. In this paper, developed a new analytical model for the performance of an energy conserving CSMA-CA in both saturated and periodic traffic conditions. The accuracy of the throughput predicted by the analysis is confirmed via comparison with simulation.

II. MODULATION

Modulation is the method of transmitting data signal over carrier signal to reduce the noise or fading effect. They are mainly divided into two categories analog and digital. In analog modulation carrier signal is modulated with the help of analog signal and in digital it modulates with digital signal Digital modulation is called   shift   keying   because in this, the carrier signal is shifted in amplitude, frequency or phase by digital input signal. Modulations are diffe rentiating by two categories, which are discussed below:

In Offset quadrature phase-shift keying (OQPSK) at a time only one bit of symbol is changed so that's why signal does not cross zero. OQPSK is also called one of the types of PSK modulation in which 4 different values of the phase can transmit. OQPSK is quite different form phase shift keying using for different values of the phase to transmit. Same as QPSK, except that the alignment of the I stream and the Q stream has a offset of T. It is also called staggered quadrature phase shift keying (SQPSK). Offset QPSK has well known advantage over QPSK. There is phase ambiguity in the carrier synchronization loop. With QPSK, there is four fold phase ambiguity where as in OQPSK it is possible to reduce to the two fold. If the filter is used at the special case of binary continues phase FSK modulation technique in which the change in carrier frequency from symbol 0 to

symbol 1or vice versa is exactly equal to one half the bit rate of input data signal. The modulation of MSK is always be 0.5. If transmitter for spectral shaping a non linear power amplifier will spectral regrowth of the sidebands for QPSK and defeating the effort to the shape of spectrum on other side it can be eliminated by the OQPSK [3]. Whereas Maximum shift keying is a we considered MSK as a special case of OQPSK, the carrier signal is multiplied by sinusoidal function. MSK is inherited from OQPSK after replacing it with rectangular pulse having a half cycle of sinusoidal pulse. MSK signal has constant envelope, MSK modulation makes the phase change linear over a bit interval. T_b. This enables MSK technique to provide a significant improvement over QPSK

III. METHODOLOGY

We have use OMNET++ simulator with maxim framework to design CSMA mac protocol.to design NIC protocol of CSMA protocol we have use sensor application layer as the application layer, wise routing for the network layer, CSMA 802.15.4 for the NIC protocol, mobility module is constant speed. Basically we all know that power consumption plays an important role in the wireless sensor network to minimize the power consumption we have use different type of modulation techniques like MSK and OQPSK16.by using these types of modulation techniques.

IV. SIMULATION RESULTS

The parameters of the CSMA were evaluated in OMNET++ with MIXIM framework. The power consumption in the WSN can be varied by changing the number of nodes. And also with the modulation techniques. The simulation results are represented as the Figure. No. 1 represents the static behaviour of nodes(mobility =0mps). And the Figure. No.2 represents the mobility behavior of nodes (mobility =1mps) by changing different modulation techniques.the results of the average power consumption in the static and the mobility behaviour are shown in the Table. I it was observed from the simulation results that the static behavior of nodes with MSK consumes less power as compare to static behavior of nodes with OQPSK16, on the other hand mobility behavior of nodes with OQPSK16 consumes less power as compare to mobility behavior of nodes with MSK.
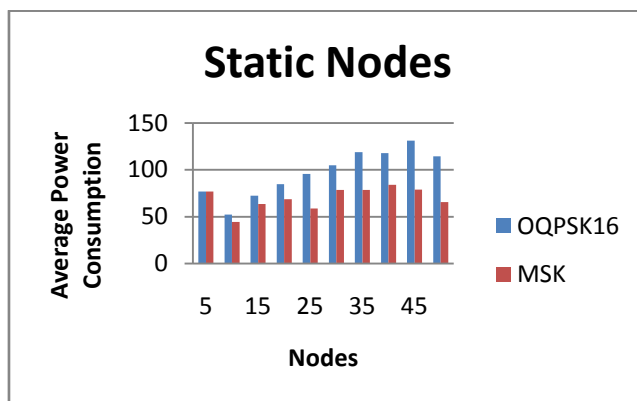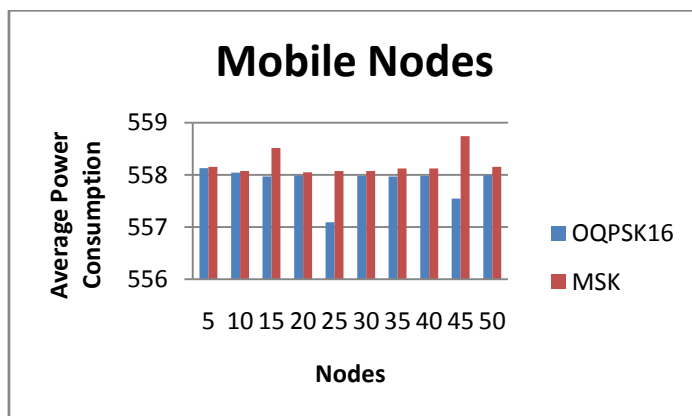

Fig. 1- Static Nodes

Fig. 2- Mobile nodes

Table 1- Power consumption

No. of nodes	Static Nodes (Avg. Power Consumption)		Mobile Nodes (Avg. Power Consumption)	
	OQPSK16	MSK	OQPSK16	MSK
5	76.95	76.885	558.126	558.153
10	52.24	44.314	558.04	558.071
15	72.276	63.572	557.971	558.515
20	84.609	68.713	557.988	558.051
25	95.758	58.713	557.093	558.071
30	104.941	78.598	557.982	558.071
35	118.896	78.617	557.969	558.123
40	117.74	84.203	557.982	558.123
45	131.126	79.083	557.546	558.742
50	114.485	65.548	557.991	558.156

V. CONCLUSION

The performance of CSMA was evaluated with different strategies under varying different Modulation techniques. The simulation had been performed in OMNET++ 4.6 with MIXIM framework by varying no. of nodes. It is observed from the simulation results that optimum performance of the system is observed with MSK in the case of static or in other hand OQPSK16 in the case of mobility. In the static behaviour of nodes with MSK consumes less power as compare to static behaviour of nodes with OQPSK16. On the other hand, if we talk about the mobility behaviour of nodes with OQPSK16 consumes less power as compare to mobility behaviour of nodes with MSK. In future, the modulation can be optimized to incorporate the less power in the system and to improve the signal quality.

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