ENERGY-OPTIMUM THROUGHPUT AND CARRIER SENSING RATE IN CSMA BASED MULTI-HOP NETWORK

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ABSTRACT

The application model for the energy consumption of a node as a function of its throughput in a wireless CSMA network. We first model a single-hop network, and then a multi-hop network. We show that operating the CSMA network at a high throughput is energy inefficient since unsuccessful carrier sensing attempts increase the energy consumption per transmitted bit. Operating the network at a low throughput also causes energy inefficiency because of increased sleeping duration. Achieving a balance between these two opposite operating regimes, we derive the energy-optimum carrier-sensing rate and the energy-optimum throughput which maximize the number of transmitted bits for a given energy budget. For the single-hop case, we show that the energy-optimum total throughput increases as the number of nodes sharing the channel increases. For the multi hop case, we show that energy-optimum throughput decreases as the degree of the conflict graph corresponding to the network increases. For both cases, the energy-optimum throughput reduces as the power required for carrier-sensing increases. The energy-optimum throughput is also shown to be substantially lower than the maximum throughput and the gap increases as the degree of the conflict graph increases for multi-hop networks.

KEYWORDS*: *CSMA, Node communication, Energy consumption, Throughput performance

I. INTRODUCTION

Improve the battery lifetimes of wireless devices and due to environmental considerations, the energy efficiency of wireless communication protocols has to be improved. There are many wireless communications protocols that employ a variant of the carrier sense multiple access protocol (CSMA) due to its simple and distributed nature. Here find the optimum carrier-sensing rate and throughput which maximizes the number of transmitted bits in a wireless CSMA network for a fixed energy budget. Recently, carrier-sensing rate adaptation algorithms have been devised to achieve throughput-optimality in a CSMA network. In these algorithms, each node senses the channel at a rate which increases with its packet queue length (or virtual queue length). As packet queues grow, the nodes may sense the channel at arbitrarily high rates. However, the increased energy consumption due to such increased carrier-sensing rate has not been investigated to the best of our knowledge. We here aim to quantify the relationship between sensing rate, throughput and energy consumption in a CSMA network. However, the proposed analysis is still applicable even when nodes perform idle listening between transmission attempts. We are interested in the following question: What is the optimum value of λ which maximizes the number of transmitted bits for the lifetime of the node which is limited by its energy budget sensing rate, this minimizes the energy consumption per transmitted bit. The energy-optimum rate exploits the trade-off between the energy consumed for sleeping and energy consumed for carrier sensing. The energy-optimum rate leads to an energy-optimum throughput, which gives the energy-optimum operating load for the network. To maximize the number of transmitted bits for a given energy budget, the network. The analysis to a multi-hop network with a random regular conflict graph. For both scenarios, we analyze the energy consumed in various states such as sleeping and carrier sensing. We derive the energy-optimum carrier sensing rate and the corresponding energy-optimum throughput which minimize the energy consumption per transmitted bit. The energy-optimum throughput exploits a balance between the energy consumed in the states of sleeping and carrier sensing per transmitted bit. The multi-hop case, we show that the energy optimum throughput depends on the degree of the conflict of graph of the network and on the power consumption of carrier sensing. We find that the energy-optimum throughput reduces as the degree of the conflict graph increases, i.e., as the interference increases. the energy-optimum carrier sensing rate and the energy optimum throughput increase as the power required for carrier sensing reduces.

II.SYSTEMARCHITECTURE

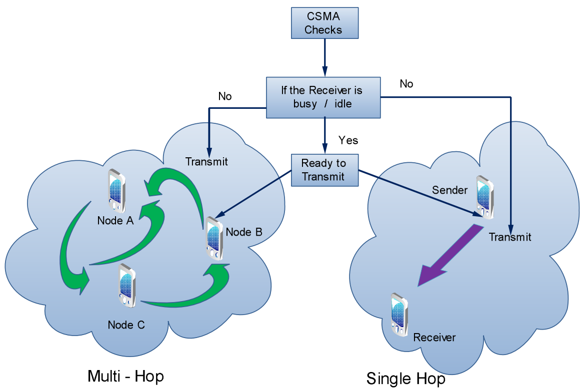

Fig 1. CSMA System Architecture

III.LITERATURE SURVEY

3.1. RI-MAC

A Receiver-Initiated Asynchronous Duty Cycle MAC Protocol for Dynamic Traffic Loads in Wireless Sensor Networks

3.1.1 Objective

Receiver-initiated data transmission in order to efficiently and effectively operate over a wide range of traffic loads. RI-MAC attempts to minimize the time a sender and its intended receiver occupy the wireless medium to find a rendezvous time for exchanging data, while still decoupling the sender and receiver’s duty cycle schedules.

3.1.2 Techniques

Receiver-Initiated MAC (RI-AC)

3.1.3 Advantages

RI-MAC significantly improves throughput and packet delivery ratio. Even under light traffic load for which X-MAC is optimized, RI-MAC achieves the same high performance in terms of packet delivery ratio and latency while maintaining comparable power efficiency.

3.1.4 Disadvantages

Low throughput

More sleeping time

Increased sleeping cost

3.2. Random Access Transport Capacity Of Multi –Hop AF Relaying: A Throughput-Reliability Tradeoff

3.2.1 Objective

To compute the random access transport capacity, we analyze the exact outage probability of multi hop transmission with AF strategy in a Poisson field of interferers without neglecting the noise at all of the nodes.

3.2.2 Techniques

Multi – hop amplify-and-forward (AF) strategy.

3.2.3 Advantages

Maximize their random access transport capacity, and this helps us to predict and manage the maximum available number of transmitting nodes per unit area to maximize their performance.

3.2.4 Disadvantages

Not Flexible

Take long time to distribute the data

Increased sleeping time.

IV. CARRIER SENSING MULTIPLE ACCESS

Carrier sense multiple access is a probabilistic media access control(MAC)protocol in which a node verifies the absence of other traffic before transmitting on a shared transmission medium, such as an electrical bus, or a band of the electromagnetic spectrum..Carrier sense means that a transmitter uses feedback from a receiver to determine whether another transmission is in progress before initiating a transmission. That is, it tries to detect the presence of a carrier wave from another station before attempting to transmit. If a carrier is sensed, the station waits for the transmission in progress to finish before initiating its own transmission. In other words, CSMA is based on the principle "sense before transmit" or "listen before talk".

Multiple access means that multiple stations send .

V. NON – PERSISTENT CSMA

Propose a protocol-independent energy-consumption analysis of the non-persistent- CSMA protocol for both single-hop and multi-hop networks. Our results provide closed from expressions describing the change of the energy-optimum operating point of CSMA networks as a function of the number of odes (for single-hop networks) and network degree (for multi-hop networks). Besides, to investigate the change in the energy optimum operating point as the ratio of powers required for carrier-sensing and sleeping changes.

VI.METHODOLOGY

6.1. Csma Based Node Sensing

In a wireless CSMA network each node senses the channel, the channel is busy or not. If the channel is busy the node wait until the channel is ready to receive the packet from the node. If the channel is idle the node sends the packet to the receiver. The main work In the CSMA is to check the channels which channel is idle and which the channel is busy.

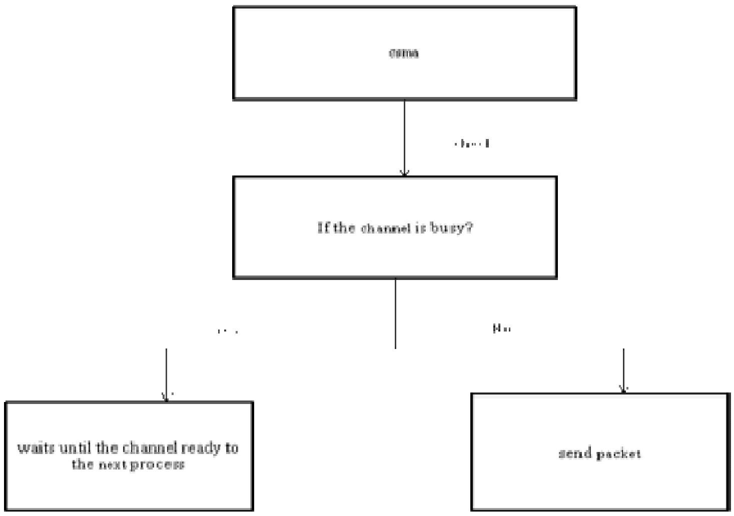

Fig 2 . CSMA Node Sensing

6.2. Node Communication

After sensing the CSMA network each node communicates with in the channel. The CSMA sense the channel if the channel is busy or not. If the channel is busy the node didn't send the data packet to the receiver it wait fraction of seconds until the receiver node can ready to receive the data from the sender node. During this time the node didn't wait long time just waits fraction of second. The receiver node is idle the sender node sends the data packet to the receiver. In this module the waiting time is decreased. And the performance is higher

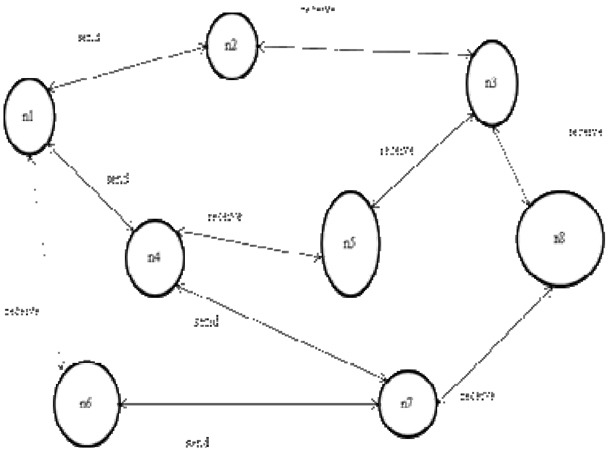

Fig3. Node Communication

6.3. Energy Consumption During Node Communication

The sender node sends the data packet to the receiver some energy are used during this communication. The energy consumed per transmitted bit. Energy spent for transmission, sleeping and carrier sensing per transmitted bit. In CSMA based node communication, the energy usage level is lower than other sensing techniques and methods .Transmit the maximum bits within the energy budget. Each node transmits and receives packets with in a time.

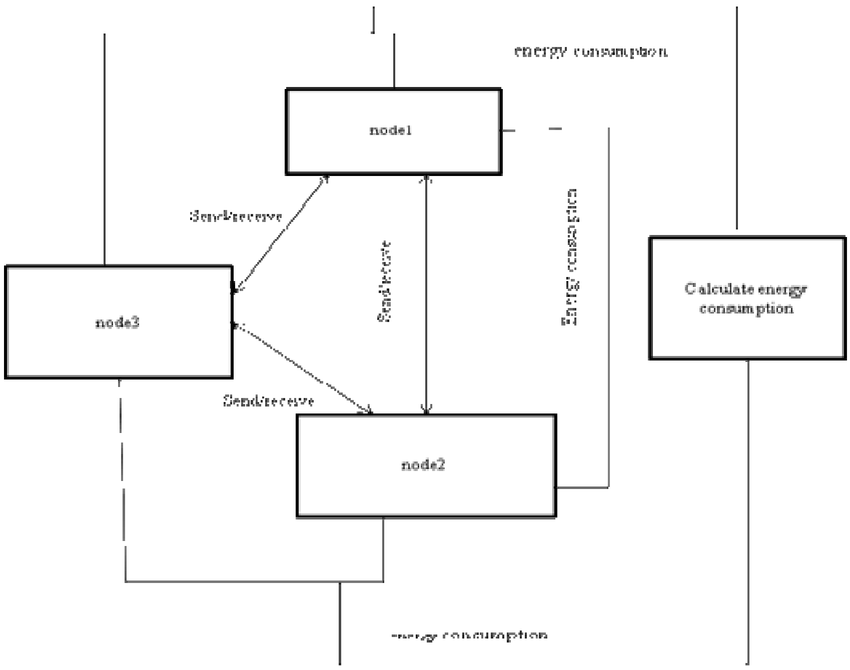

Fig 4. Energy Consumption

6.4. Energy Optimum Throughput Performance

Energy consumed while carrier sensing the total energy consumption at high throughputs to maximize the number of transmitted bits for a given energy budget. The energy optimum throughput is based on the carrier sensing rate. If the carrier sensing attempts are successfully sensed then the energy consumption of the transmitted bits are decreased. Each successful carrier sensing attempts can decrease the energy usage of the node and the performance automatically improved.

VII. CONCLUSION AND FUTURE ENHANCEMENT

In future each node sense the channel if the node is busy or not. After sensing the node sends the packet to the receiver. During this transmission some energy consumed. Every transmission of the node send the packet with some energy limits each node send the packet with automatically calculate energy usage of the particular data packet transmission. Data packets are sending based on the particular energy of the size of the data packet. In this module to avoid the data packet drops.An energy consumption model of a node in a CSMA network. The proposed model shows that the number of failed carrier sensing attempts significantly increases at high throughputs causing energy waste. On the contrary, at low throughputs, nodes sleep during most of their lifetimes which also results in energy waste as far as the energy per transmitted bit is considered. Derive the energy-optimum carrier sensing rate and the corresponding energy-optimum throughput for both a single-hop network and a multi-hop network. For single-hop networks, we observe that the energy optimum throughput increases with the number of nodes sharing the channel. On the other hand, the energy optimum throughput reduces with the degree of the conflict graph for multi-hop networks. For both the single-hop and multi-hop case, our results suggest that as the power required for carrier sensing increases, the energy-optimum sensing rate and throughput reduce for the design of adaptive optimal-CSMA algorithms. We observe a dramatic increase in the carrier-sensing rate as the throughput approaches its limit; as a result, the energy consumption also increases significantly. The trade-off between the energy consumption and throughput has to be considered in the design of adaptive MAC algorithms.

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BIOGRAPHY NOTES

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