ISSN: 2321-8169
2727 – 2730

An Energy Conservative System for Reducing DOS Factors using Network Simulator 2

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***Abstract*—**A wireless sensor network involves collection of wireless sensor nodes which are located to control various real time applications like pressures, weather, temperature, humidity, etc. So, Wireless sensor networks (WSNs) involve potential applications interacting with the physical world, such as surveillance and environmental monitoring. The sensor nodes of the network application mainly run on to the powered battery system and thus the network's life is the liability of the battery's power. Hence, to sustain a better optimal on limited power and security mechanism for the sensor network to be energy efficient anycast forwarding scheme is proposed and used in this paper. In the network each node has multiple next-hop relaying nodes in a candidate set (forwarding set), result in reducing the event-reporting delay and minimizing the power consumption. A sending node can forward the packet to the first node that wakes up in the forwarding set.

Keywords- *Sensor,Energy, Delay, Node,MAC, DSR.*

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I. INTRODUCTION

A. Background

The four major energy consumption activities are: energy consumed by communication radios; the energy consumed while transmission and reception of control packets; the energy required to keep sensors on; and energy consumed while data transmission and reception. The activity of data transmission and reception is a rarely occurring event and thus only a fraction of the total energy is consumed. But, the network sense events occur constantly with continous and uncontrolled energy consumption. Thus we propose extending the network's lifetime by controlling the energy expended to keep the communication system on (for listening to the medium and for control packets).[1]. So, wireless systems while waiting for a packet to arrive consumes most of the energy. Hence, sleep wake scheduling is an effective mechanism to prolong the lifetime of these energy constrained wireless sensor networks. In sleep wake scheduling a transmitting node needs to wait for its next -hop relay node to wake up which may cause a substantial delay. This delay can be minimized by using some of the DSR techniques and packet forwarding schemes.[2].

B. Wireless Sensor Network

Wireless ad-hoc network constitutes mobile nodes communicating over wireless links with processing capability, multiple types of memory (program, data and flash memories), RF transceiver, and power source and accommodating various sensors and actuators. There are two types of wireless sensor networks.

1) Structured
2) Unstructured

The structured wireless sensor networks plan the deployment of sensor nodes while the deployment is in an ad-hoc manner in the unstructured wireless sensor networks. These wireless sensor nodes consume maximum energy while listening. We generally solve this problem by using duty cycling in the WSN. Time synchronization rules in critically for diverse purposes, including sensor data fusion, coordinated actuation, and power-efficient duty cycling [3]. Sensor nodes periodically switch between active and sleeping state, called as Duty cycling. These nodes transmit and receive data in the active state while going completely dormant in sleeping state in order to save energy. Here, synchronization between the operating cycles of different nodes is motivated as the radios of both machines must be on to transmit a packet from one machine to another. Example of protocols using synchronized approach: S-MAC, T-MAC, and RMAC [4].

We synchronize the current duty cycling MAC layer protocols for wireless sensor networks using explicit schedule exchanges or leave totally unsynchronized as both possess weaknesses and deficiencies. Duty cycle and packet transmissions are scheduled by periodic synchronization messages (SMAC, TMAC and DMAC), which consume significant energy even at null traffic. BMAC wakes up receiver using unsynchronized duty cycling and long preambles mechanism. However, the long preamble mechanism has the following problems. First, the latency accumulated along multihop routes could be deluging due to the use of long preambles on each hop. Second, after the awakening of the receiver, the energy consumed on preamble transmission and reception is wasted. This all can be avoided if sender's side is aware of the receiver's wake up schedule and thus choosing the preamble length conservatively. Third, unneeded preamble overhearing by neighbour nodes other than the intended receiver by remaining awake till the last data packet transmission results in energy wastage. [5]-[6].

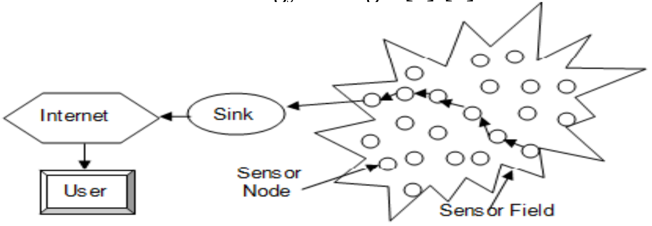

Figure 1. Basic Architecture of Wireless Sensor Netwrok

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To reduce the packet delivery latency, higher power efficiency, higher packet delivery ratios for traffic loads, integration of scheduling algorithm, and access control to maintain a proportional one–to-one mapping function between a data period and the subsequent sleep period, DW-MAC uses a new energy efficient duty cycle MAC protocol.[4]. The major elements characterizing the performance of a sensor network, e.g., power consumption in different operating conditions, the impact of weather conditions, interference between neighbouring nodes, etc. are also aiming to be analysed and studied.. Analysis, even being the part of specific technology, provides specific general information about the transmission range of mote sensor nodes decreases significantly in the presence of fog or rain [7].

C. The protocol used in Wireless Ad-hoc Network

One of the various sleep wake protocols, we have synchronized sleep-wake scheduling protocols have been proposed in [3],[8]-[11]. These protocols are mentioned when sensor nodes periodically or aperiodically exchange synchronization information with neighbouring nodes. However, such synchronization procedures can cause additional communication overhead, and consuming a considerable amount of energy. The On-demand sleep-wake scheduling protocols as proposed in [12], where nodes turn off most of their circuitry and always turn on a secondary low-powered receiver to listen to “wake-up” calls from neighbouring nodes when there is a need for relaying packets. However, this on-demand sleep-wake scheduling have an additional receiver which significantly increases the cost of sensor motes. Hence, to save energy, each node wakes up independently of neighbouring nodes in the above protocols. But there is an occurring additional delay at each node along the path to the sink as each node needs to wait for its next-hop node to wake up before it can transmit the packet, adds constraints to it. In a situation like fire detection and Tsunami alarm the delay is unacceptable and thus, to minimize the event reporting delay for such delay sensitive applications are used: On Demand (Reactive). The Dynamic Source Routing protocol (DSR) is a simple, on demand and efficient routing protocol designed for multi-hop wireless ad hoc networks. It can organize and configure protocols by itself without any additional help of any existing network infrastructure or administration. In DSR the two routing mechanisms, i.e. (a) Route Discovery and (b) Route Maintenance working together to allow nodes to discover and maintain source routes to arbitrary destinations in the wireless ad hoc network. It won't require up-to-date routing information in the intermediate nodes through which packets are forwarded and also called as a loop free technique. It facilitates nodes forwarding packets to cache the routing information in them for their own future use. It allows the packet overhead to those nodes that are reacting to changes in the current use routes. Nodes forward the packets for each other to allow communication over multiple “hops” between nodes that are not directly within the wireless transmission range of one another. All routing about sources of intermediate changes and also joining or leaving of nodes in the network are determined and maintained by DSR. Since, there may be a change in the number or sequence of intermediate hops to reach any destination, the resulting network topology may be quite rich and rapidly changing. The DSR protocol also finds the multiple routes (hops) to any destination in the ad hoc network. There is an order list of nodes through which the packets with the information header must pass. DSR can successfully discover and forward packets over uni-directional links as if other protocols operate correctly only over bidirectional links.

II. Proposed Algorithm

There is a significant increase in the cost of sensor motes due to the additional receivers in the DSR routing protocol using an on-demand synchronized sleep-wake schedule. As it is impractical for a node to be known of wake-sleep schedule of other nodes, leading to the additional delays along the path to the sink because each node needs to wait for its next-hop node to wake up before it can transmit. But the delay is minimized for the delay sensitive applications, such as fire detection or tsunami alarm, where delay is unacceptable. In traditional packet-forwarding schemes, every node has one designated next-hop relaying node in the neighbourhood, and it has to wait for the next-hop node to wake up when it needs to forward a packet. Each node has multiple next-hop relaying nodes in a candidate set (forwarding set). A sending node can forward the packet to the first node that wakes up in the forwarding set. Thus the Anycast forwarding proposed scheme reduces the event-reporting delay and minimizes the power consumption.

A. Flowchart

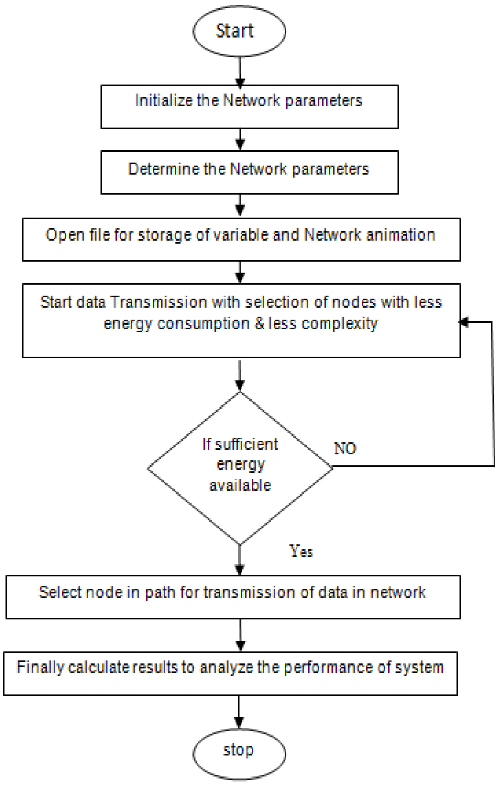

Figure 2. Flowchart of anycast forwarding Scheme.

III. Simulations and Results

We have simulated the various parameters by Network Simulator 2 (NS2) and compared with existing techniques of

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on demand (reactive) routing protocol, DSR. We achieved our major objective that anycast forwarding technique has significant improvement as compared to the existing individual Reactive Protocol using these simulations.

TABLE I. PARAMETER VALUE OF SIMULATION ENVIRONMENT

Simulator	Network Simulator 2.34
Network Size	1500m x 1500m
No. of nodes	20
Simulation Time	30Sec
MAC Type	802.11
Bandwidth	2Mz
Traffic Sources	CBR
Traffic Agents	UDP
Interface Queue Length	250
Packet Size	512 Byte data
Routing Protocol	DSR
Antenna Type	Omni-directional
Initial Energy	850Joules

The Performance analysis of proposed anycast forwarding technique is done by comparing with existing on demand technique on the basis of the following parameters:

a) End to End delay b) Throughput c) Energy

A. *End to End delay performance Comparison*

It is the delay from the time when an event occurs to the time when the packet due to this event is received at the sink [8]. The average time taken by the data packet to arrive at the destination in the wireless ad-hoc network. It also includes the delay caused by route discovery process and the queue in data packet transmission.

Delay = Tr – Ts

Whereas Tr is arrive time & Ts is send time

The lower value of end to end delay means the better performance of the protocol. The proposed work shows the comparable end to end delay with existing DSR is shown in figure 3.

B. *Throughput performance Comparison*

Throughput refers to the ratio of the amount of packets received at the Destination to the amount of packets transmitted at the Source. It must be higher for the better performance of the network.

$$\text{Throughput} = \frac{\text{(Total Data Bits Received)}}{\text{(Simulation Runtime)}}$$

Here the proposed stats depicts the higher throughput of anycat forwarding technique as compared to existing DSR technique is shown in figure 4.

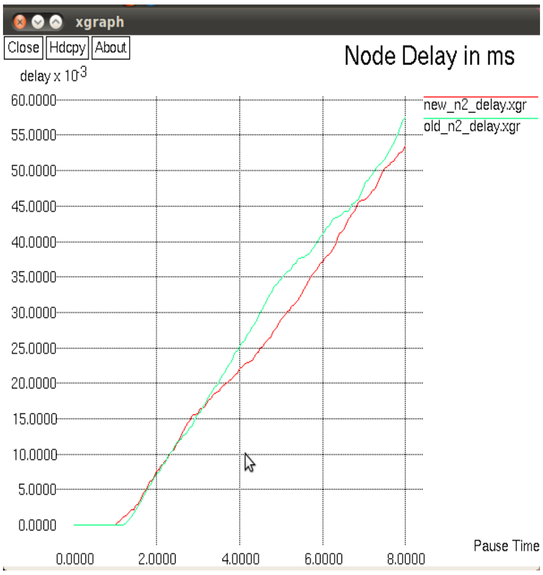

Figure 3. Delay v/s pause time comparison

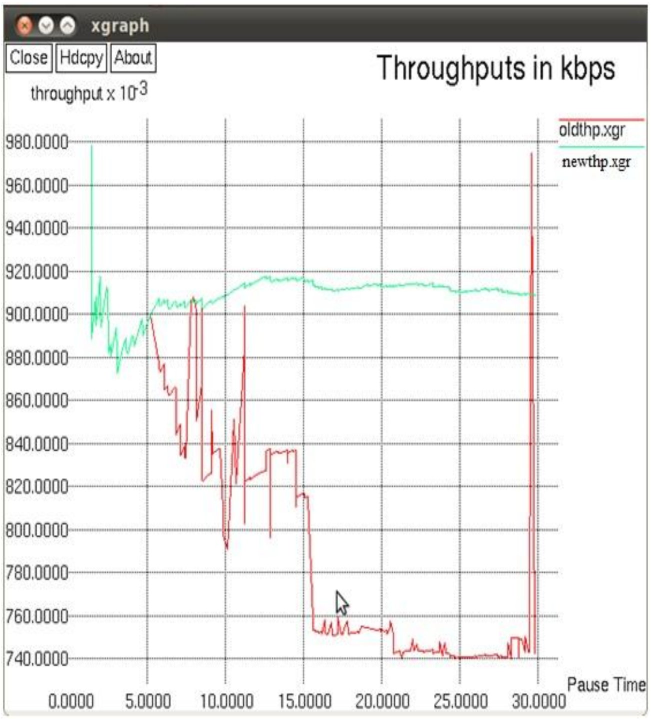

Figure 4. Throughput v/s pause time comparison

C. *Energy Performance Comparison*

As energy is consumed while sending a file or data, with the consideration of the size of the packages. Since it is just impractical possible to replace the batteries of a large number of deployed sensors in the hostile environment. So, to develop an energy efficient network keeping consumption as low as possible our proposed network consumes less energy as compared to the existing DSR technique.

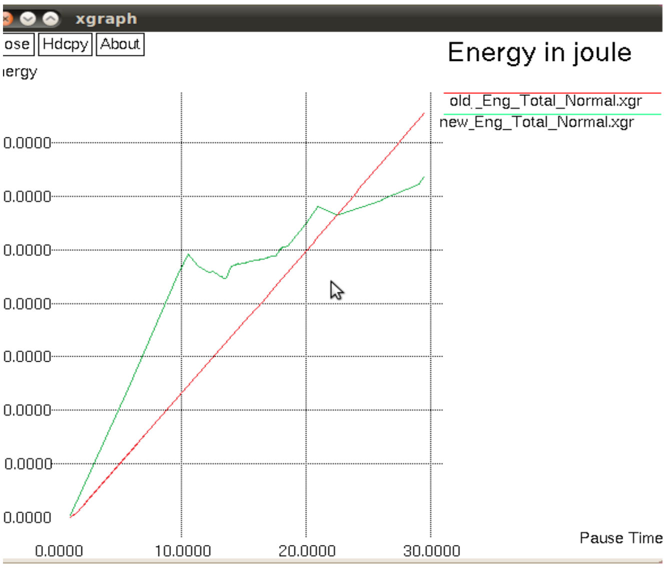

Figure 5. Energy versus Pause time Comparison

IV. Discussion

Hence, it can be concluded that anycast forwarding technique outsmarts and over performs the existing DSR technique. Network parameters act as the performance markers. Thus, in the proposed work, the results in terms of end to end delay is lower along with higher throughput and less required energy as in comparison to the existing DSR. Hence, it makes us to conclude that results of proposed protocol are better or comparable with existing DSR protocol.

Acknowledgment

At the last of it we are thankful to all the faculty members of BGIET (Sangrur) whose fruitful suggestions enhanced and enriched the beauty of this paper presentation..

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