Life Time Enhancement of Nodes by Reducing Power Consumption in Cockroach Network Using DSR – A Survey

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A R T I C L E  I N F O

ABSTRACT

Background: In ad-hoc network, where all nodes can act as router it is necessity to maintain the power of all intermediate nodes to have loss-less communication. Enhancement of lifetime of nodes in wireless sensor network are essential one since at any time any node can utilized by another node in the network. In this paper we propose a method to achieve energy efficiency in WSN by dynamic source routing protocol. Objective: To implement the design of energy consumption and enhancing life time in Dynamic Source Routing in NS-2. Results: Comparison of DSR, EESSDA and EADSR based on performance metric: Network Latency, Network Lifetime and Network Traffic. Conclusion: The paper is collected survey of techniques used in the wireless sensor networks for enhancing the life time of networks.

INTRODUCTION

Wireless Sensor Network is a network of large numbers – up to thousands – of tiny spatially distributed radio-equipped sensors. Each node in a sensor network is composed of a radio-transducer, a small micro controller and a long lasting battery for energy source. These sensor networks are used for gathering information needed by smart environments and are particularly useful in unattended situations where terrain, climate and other environmental constraints may hinder in the deployment of wired/conventional networks. An individual node failure is not an issue because of the large scale deployment of these nodes and normally the target area is monitored by several nodes. Primarily these sensors are used for data acquisition and are required to disseminate the acquired parameters to special nodes called sinks or base-stations over the wireless link as shown in figure 1. The base-station or sink collects data from all the nodes, and then analyses this data to draw conclusions about the on-going activity in the area of interest (Sami Halawani and Abdul Waheed Khan, 2010). Different network architectures and routing protocols to reduce energy consumption (S. Mishra, I. Woungang, and S.C. Misra, 2011) and to expand sensor network lifetime has been analysed.

Fig. 1: Sensor Network Architecture.

Network Design Challenges and Routing Issues:
The design of routing protocols for WSN is challenging because of several network constraints. WSN suffer from the limitations of several network resources, for example, energy, bandwidth, central processing unit, and storage (Taochun Wang, Xiaolin Qin, and Liang Liu, 2013 and Alkalbani, 2013). The design challenges in sensor networks involve the following main aspects (M. Sheik Dawood, S. Sadasivam, 2011, Taochun Wang, Xiaolin Qin, and Liang Liu, 2013 and Alkalbani, 2013).

**Limited energy capacity:**
Since sensor nodes are battery powered, they have limited energy capacity. Energy poses a big challenge for network designers in hostile environments, for example, a battlefield, where it is impossible to access the sensors and recharge their batteries. Furthermore, when the energy of a sensor reaches a certain threshold, the sensor will become faulty and will not be able to function properly, which will have a major impact on the network performance. Thus, routing protocols designed for sensors should be as energy efficient as possible to extend their lifetime, and hence prolong the network lifetime while guaranteeing good performance overall.

**Scalability:**
Routing protocols should be able to scale with the network size. Also, sensors may not necessarily have the same capabilities in terms of energy, processing, sensing, and particularly communication. Hence, communication links between sensors may not be symmetric, that is, a pair of sensors may not be able to have communication in both directions. This should be taken care of in the routing protocols.

**Network Level:**
Choice of communication methods and protocols to minimize energy consumption. In a sensor node (Minakov, 2009, S. He, J. Chen, Y. Sun, D. K. Y. Yau, and N. K. Yip, 2010 and A. Jarry, P. Leone, S. Nikoletseas, and J. Rolim, 2011) there are four essential parts: processing unit, sensing unit, transceiver unit and power unit. Processing unit is a part of microcontroller unit which can read sensor data, perform some minimal computations and make a packet ready to transfer in the wireless communication channel. Figure 1 reflects power consumption of WSN in various states.

![Power Consumption of WSN in Various States Sensor](image)

**Fig. 2: Power Consumption of WSN in Various States Sensor.**

**Problem Statements:**
Energy constraints combined with a typical deployment of large number of sensor nodes pose many challenges to the design and management of WSN and necessitate energy-awareness at all layers of the networking protocol stack (Md Nafees Rahman, M A Matin, 2011). In this paper, a simple scheme for improving the network lifetime is proposed and the performance with other existing approach is evaluated.

**Methodology:**
The primary design goal of WSN is to acquire the monitored data from target area and deliver it to base station for its evaluation, while trying to prolong the lifetime of the network. The design of routing protocols in WSN is influenced by many challenging factors and these factors must be considered to achieve efficient communication in WSN. In the following section, we briefly discuss some of these design issues that affect routing process in WSN.

**Data Aggregation:**
Data aggregation is the combination of data from different sources by using functions such as suppression (eliminating duplicates), min, max and average (Taochun Wang, Xiaolin Qin, and Liang Liu, 2013). Since computation consumes less energy than communication so great energy savings can be obtained through data
aggregation. This technique has been used to achieve energy efficiency and traffic optimization in a number of routing protocols (M. Sheik Dawood, S. Sadasivam, 2011 and Alkalbani, 2013). In some network architectures, all aggregation functions are assigned to more powerful and specialized nodes (Minakov, 2009). Signal processing methods can also be used for data aggregation. In that case, it is referred to as data fusion where a node is capable of producing a more accurate output signal by using some techniques such as beam forming to combine the incoming signals and reducing the noise in these signals (Taochun Wang, Xiaolin Qin, and Liang Liu, 2013).

Fig. 3: In-network processing.

**SPANDSR:**
Another improvement to Span-DSR would involve a fast handoff of routes between a withdrawn coordinator and its replacement, eliminating the latency of routing through a sleeping node and waiting for a route error to propagate to the source. There are many issues with this approach, including the fact that a new coordinator may not be able to take over all routes (connectivity may have been restored by two announcing coordinators instead of one). Another simple way to avoid the latency of routing through a withdrawn coordinator would be to make the coordinator stay up until all outstanding packets are cleared and a new route has been found.

**Hybrid Energy-Efficiency Distributed CLUSTERING (HEED):**
The extended version of the basic scheme of LEACH is called HEED (Oliver Kosut, Lang Tong, Fellow, and David N. C. Tse, 2014 and S. Mishra, I. Woungang, and S. C. Misra, 2011) in which power balancing is achieved by using residual energy and node degree as a metric for cluster selection. The four most important primary goals of HEED are listed below:
1. Prolonging network lifetime by distributing energy consumption.
2. Terminating the clustering process within a constant number of iterations.
3. Minimizing control overhead.
4. producing well distributed CHs and compact clusters.
Since CHs are selected randomly in LEACH, which increases the rate of death of nodes. But it is not possible in HEED, so it improves network lifetime over LEACH.

**Approach on Improving the Lifetime of a WSN:**
We have introduced relay nodes in conjunction with the PSO based algorithm. These relay nodes reduce the burden of the data traffic on the sensor nodes, especially of those, which are close to the sink, by carrying the data traffic to the sink. Hence the energy consumptions of the sensor nodes decrease and the lifespan increases. The optimal location of the sink with respect to those relay nodes is found by using the PSO based algorithm (Md Nafees Rahman, M A Matin, 2011).

**Station controlled Dynamic Clustering Protocol:**
Cluster based routing has several merits like minimized control messages, re-usability of bandwidth and enhanced power control. Those technique reduces the energy consumption but with several disadvantages like lack of QoS, inefficient transmission.

**Optimized Lifetime Enhancement Scheme for Data Gathering:**
Thus energy difference between the various nodes increases with time resulting in degraded network performance. The LEACH and PEGASIS schemes which provided elegant solutions to the problem suffer basic drawbacks due to randomization of cluster heads and greedy chain formation respectively. In this paper, we propose an Optimized Lifetime Enhancement (OLE) Scheme which shows enhanced performance over these schemes. OLE increases the network performance by ensuring a sub-optimal energy dissipation of the individual nodes despite their random deployment (M. Sheik Dawood, S. Sadasivam, 2011).
Method of Reducing Power Consumption:
A method for reducing power consumption in a wireless sensor network is provided. An optimized path destined for a sink node is set using a common channel in which first and second nodes use a CSMA scheme. A first channel is set and transmission/reception slots for packet transmission/reception are allocated in the first channel. A packet is transmitted to the second node through a first transmission slot using a TDMA scheme. When a packet is not received from the second node through a first reception slot within a first set amount of time, the first reception slot is allowed to transition to an inactive state. The first node is one of the sink node, at least one parent node and at least one child node of the parent node, and the second node is one of child nodes of the first node.

Proposed Methodology:
In existing method when there is a long time packet transmission exist between two nodes, these cause the packet travel through set of nodes and finally make energy drain only on those set of nodes and causes them to ran out of energy at one time and no longer could they exist in network. We propose dynamic source routing, which is on demand protocol. So it consumes minimum bandwidth than proactive protocols. Since it is reactive protocol the data aggregation is not required. The intermediate nodes do not necessary to have more memory units, since the intermediate nodes only does forwarding and does not store the data, i.e., only routes its inlet data to outlet route. The residual energy prediction is proposed among availability of nodes, the high power nodes are predicted and alternate path will be chosen.

Simulation Results:
Simulation has become a very powerful tool for industrial application as well as in academics, nowadays. It is now essential for an electrical engineer to understand the concept of simulation to study the system or circuit behavior without damaging it. The tools for doing the simulation in various fields are available in the market for engineering professionals.

Fig. 4: Network Time of DSR, EESSDA AND EADSR.

Fig. 5: Network Latency of DSR, EESSDA AND EADSR.

The simulation results and performance comparison of the three routing protocols is analyzed. The performance comparison of DSR, EESSDA and EADSR based on metrics such as throughput, control overhead, packet delivery ratio and average end-to-end delay by using the NS-2 simulator. Simulations were done by
varying the number of nodes and keeping speed of the node is constant (20ms) then varying the speed of the nodes keeping the number of the nodes is constant (40nodes). The number of nodes for each comparison was also varied from 30 to 40 to 50 to identify the result. In all scenarios the Comparison were based on performance metric: Network latency, Network Lifetime, End to End Delay and Network Traffic

Conclusion:

The paper is collected survey of techniques used in the wireless sensor networks for enhancing the life time of networks. These energy saving methods are basically used to increase the life time of sensor nodes in wireless sensor networks.

The future work the proposed method uses to split the packets along cockroach network and each packet would take separate best energy path in their route what the contribution for reducing the power consumption is and enhance the lifetime of sensor networks

REFERENCES


