# International Journal of Engineering Research and Science & Technology

ISSN : 2319-5991
Vol. 4, No. 1
February 2015



www.ijerst.com

Email: editorijerst@gmail.com or editor@ijerst.com

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com
Vol. 4, No. 1, February 2015


*Research Paper*

# ENERGY-EFFICIENT RELIABLE ROUTING FOR INCREASING LIFE TIME OF WIRELESS AD HOC NETWORKS

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Wireless Sensor Network is a network of sensor nodes without having any central controller. Its growth is expeditiously increasing and that's why there is an immense field for research in this area. Sensors depend entirely on the trust of their battery of power, which can't be revitalized or substituted. So the design of energy aware protocol is essential in respect to enhance the lifetime network. LEACH is an energy efficient hierarchical based protocol that balances the energy expenses, saves the node energy and hence to prolongs the lifetime of the network. So, this paper presents a detailed review and analysis of LEACH protocol. Comparison of the various networks parameters is done in the form of tables and graphs. The simulation of the work has been carried out by using own set of parameters and in the last of the paper conclusions is drawn.

***Keywords:*** Wireless Sensor Networks, LEACH protocol, Simulation

## INTRODUCTION

Wireless technologies have become increasingly popular in our everyday business and personal lives. Personal Digital Assistants (PDA) allow individuals to access calendars, e-mail, and address and phone number lists, and the Internet. Some technologies even offer Global Positioning System (GPS) capabilities that can pinpoint the location of the device anywhere in the world. In the wireless technologies promises to offer even more features and functions in the next few years. WSN is a very large array of diverse sensor nodes that are interconnected by a communication network. The elementary components of sensor nodes are sensing unit, a processing unit, transceiver unit.

The sensor nodes senses the physical quantity is being measured and coverts it into an electrical signal. After that the signal is fed to an A/D converter and is ready to be used by the processor (Li *et al.,* 2006). The processor will convert the signal into data depending on how it is programmed and it sends the information to the network by using a transceiver. The sensing data is shared between the sensor nodes and are used as input for a distributed estimation system

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(Nagi *et al.,* 2008). The fundamental objectives of the WSN are most reliability, accuracy, flexibility, cost effectiveness, and ease of deployment. The WSN is made up of individual multifunctional sensor nodes (Mohanoor *et al.,* 2009).

As we know that wireless sensor network mainly consists of tiny sensor node which is equipped with a limited power source. The life span of an energy network is constrained sensor network is determined by fastly the sensor consumes energy. A node in the network is no longer useful when its battery dies. Researchers are now developing new routing mechanisms for sensor networks to save energy and pro-long the sensor lifespan. The dynamic clustering protocol allows us to space out the lifespan of the nodes, allowing its do the minimum works it needs to transmit the data (Misra and Banerjee, 2002). The WSN can be applied to a wide range of applications, such as environment management monitoring, industrial sensing and infrastructure protection, temperature sensing. So, it is essentially to improve the energy efficient to enhance the quality of application service. In this paper, to address his problem of energy efficiency reliable routing in wireless networks in the presence of unreliable communication links or devices or loss wireless link layers by integrating the power control techniques into the energy efficient routing. The link layer implements a perfect reliability and the case when the reliability is implemented through the transport layer (Wang *et al.,* 2006).

Nodes in an ad hoc network have limited power resources as well as limited the processing power. When a routing, a sharp degradation in the network service may result if the routing algorithm does not account for the limited resources, eventually decreasing the lifetime network (Senel *et al.,* 2007). To maximize network lifetime, the paths for message flows are chosen in such a way that the total energy consumed along the path is minimized while avoiding the energy in the depleted nodes. To finding the path network which consume minimum energy and finding paths which do not use energy depleted nodes lead to conflicting objectives (Verma *et al.,* 2008). In contrast to conventional power aware algorithms, The MRPC identifies the capacity of a node just by its residual battery energy, but also been the expected energy spent in reliably packet over forwarding the specific link. Such the formulation method captures the scenarios of where link transmission costs also has depend on physical distances between nodes and the link error rates (Toh, 2001).

A realistic power consumption model of the wireless communication subsystems can be typically used in many sensor network node devices is presented. The simple power consumption models for major components are individually identified; the effective transmission range of the sensor node is modelled by the output power of the transmitting a power amplifier, to sensitivity of the receiving low noise amplifier, and RF environment (Dongkyun *et al.,* 2003). Traditionally, the PSR method is estimated to fraction of successful transmissions over a window of a test packet. In order to demonstrate that counting based methods do not react to changes in the wireless channel fast enough and that the only way to address this problem is to estimate the PSR based on the receiver's characteristics and on the Signal to Noise Ratio (SNR) at the receiver (Jae, 2004). Instead, in QUEST, the per-rate/-neighbor management of link quality is achieved by profile lookup. We

perform test bed experiments to achieve the profile and also unravel two major bugs in Midwife driver, widely employed by many researchers to build an 802.11 based system. To utilizing the large database of transmitter and receiver traces with an indigenously developed tools, in order to study the impact of an altering the averaging time period on the profile for different transmission rates (Hongwei, 2009).

## LEACH PROTOCOL

Low Energy Adaptive Clustering Hierarchy (LEACH) is the first hierarchical cluster based routing protocol for wireless sensor networks which its partitions the nodes into clusters, every each clusters dedicated to the node with extra privileges called Cluster Head (CH) is responsible for creating and manipulating a Time Division Multiple Access (TDMA) schedule and sending the aggregated data from nodes to the BS where these data is needed using Code Division Multiple Access (CDMA) remaining nodes are cluster members.

### Routing

LEACH protocol is the first hierarchical cluster based routing protocol for wireless sensor network which partitions the nodes into cluster, in each clusters dedicated to the node with extra privileges called CH is responsible for creating and manipulating a TDMA schedule and sending aggregated data from nodes to the BS where these data is needed using CDMA.

### Ad Hoc Networks

The sensor nodes can be communication each other without via base station and the sensor networks application may be one of method or combine two kinds of methods. For example, LEACH in categorization of the sensor nodes into many clusters, and according to the algorithm select one of clusters head of them. The clusters head will be a management and then the process of the nodes been cluster, then communication between the node and sink. The cluster head is like a base station.

### Energy Saving for Packet Sending Wireless Links

Let x-bit represent the size of a packet transmitted over the physical link and let $\varepsilon u$, v(x) represent the energy saving by a transmitted node u to transmit a packet of length x to a receiving node v through the physical link (u.v). $\omega u$, v(x) denote the energy saved by the receiving node v to receive and process the packet of length x transmitted by u. Represents the energy saved by the transmission could be abstracted into two distinct parts, the circuit excluding the power amplifier of them transmitter. Power amplifier is to generate the required output power for data transmission over the air. The energy saving method is to receiving the circuit including the Low Noise Amplifier (LNA) of the receiver.

### Minimum Energy Cost Routing

Reliability and energy cost of routes must be considered in route section. The key point is that the energy of the cost route is related its reliability. If the routes are less reliable, the probability of the packet transmission increases. Thus, larger amount of the energy will be consumed per packet due to retransmissions of the packet. By defining ways of computing the energy cost of routes, design sets of energy-aware reliable routing algorithms for HBH and E2E systems. They are called Low Energy Adaptive Reliable Routing (LEARR).

## SLEEP PROTOCOL

The purpose of this protocol is to offer health care providers an understanding of the importance of promoting sleep in patients who have delirium or are at risk for developing delirium during their hospital admission. The protocol will also provide an approach to caring for patients who have a disturbance in their normal sleeping pattern and are at risk for sleep deprivation.

**Get to sleep** (get back to sleep)

1. As soon as sleep protocols are awake and its try to get back to sleep immediately. This is a time to not a ponder, plan, to ruminate or rehearse. Observe the urge and return to getting back to sleep.
2. Stay physically drowsy. To move at all, at only once, and it's gently so as not to wake up. Don't turn on the light. To Use relaxation techniques: (1) Scan the body in a calm and leisurely method.

## NETWORK SIMULATOR

Network simulation is a technique where a program models the behavior of a network either by calculating the interaction between the different network entities using a mathematical formulas or actually capturing and playing back observations from a production network. Network simulation plays a vital role in communication and computer network in which program models the behavior of a network by calculating the interaction between the different network entities using mathematical formulas. The behavior of the network can be observed in a test lab.

Network simulator software predicts the behavior of a computer network. In simulators the computer network modelled and then performance is analyzed. Typically the users can they customize the simulator for their specific needs. Usually simulator come with support for the protocols and network in use such as WLAN, Wi-Max, TCP, WSN, cognitive radio. Network simulator can also provide other tools to facilitate visual analysis.

Network Simulator (version 2), widely known as ns-2, is simply a discrete event driven network simulation tool for studying the dynamic nature of communication networks. It is an open source solution implementation in C++ and Otcl programming languages. NS-2 provides a highly modular platform for wired and wireless simulations supporting different network element, protocol traffic, and routing types. In general, ns-2 provides users with a way of specifying network protocols and simulating their corresponding behaviors. Result of the simulation is provided within a trace file that contains all occurred events.

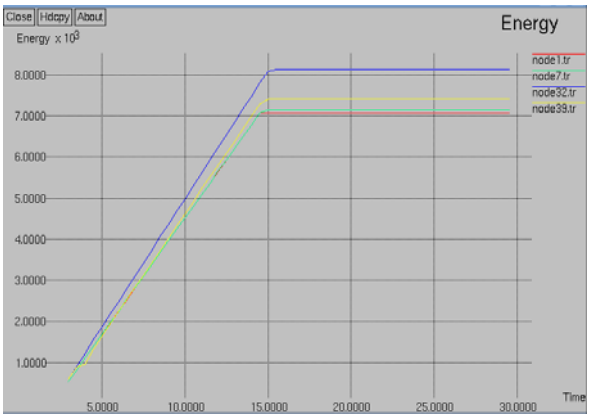
## EXPERIMENTAL RESULTS

### Existing Model

To evaluate the performance of RMECR and RMER algorithms, to consider the network in which nodes are uniformly distributed in a square area. Nodes are assumed to be static. If there is no error in the header and preamble the payload method is detected. Nevertheless, the payload is detected erroneously, the packet will be dropped. Increasing the transmission range reduces the number of times a packet needs to be forwarded en route to its final destination.

Figure 1 denotes the energy diagram of existing system. In this system the threshold value only fixed to the node operation. The source node and destination nodes are automatically

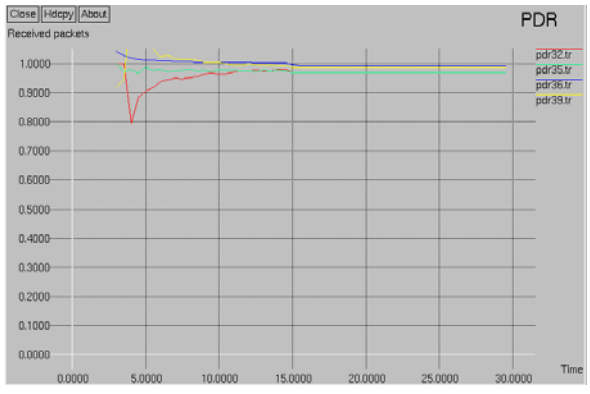
**Figure 1: Energy Diagram of Existing System**




considered. For the node threshold value decreases the packet losses will be created.

Figure 2 denotes the packet delivery ratio of existing method. The ratio of the number is delivered the data packet to the destination. This illustrates the level of delivered data to the destination. In this method the packet delivery ratio is simulated. When a packet loss increases the ratio value will be increased.

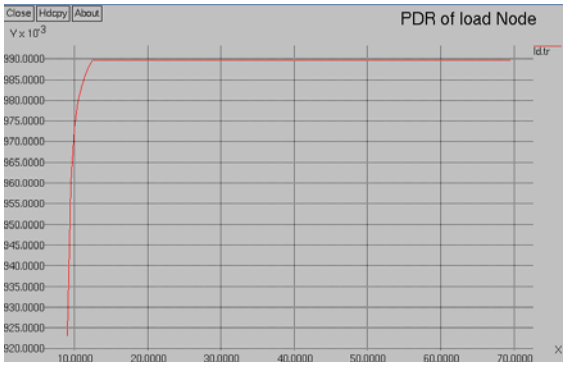
**Figure 2: Packet Delivery Ratio**




## Proposed Method

The proposed method the energy efficient based life time network has used for and to create nodes, it forms to a group of clusters. The packet data has delivered to cluster. The Packet to

**Figure 3: PDR of Load Node**




Delivery Ratio ( PDR) represents for a ratio of delivered the packets.

For the simulation process the threshold value, source node, destination node and load node has been created. For the simulation process the source node has been delivered the data between the sources to the destination via load node. In

**Figure 4: Energy of Load Node**

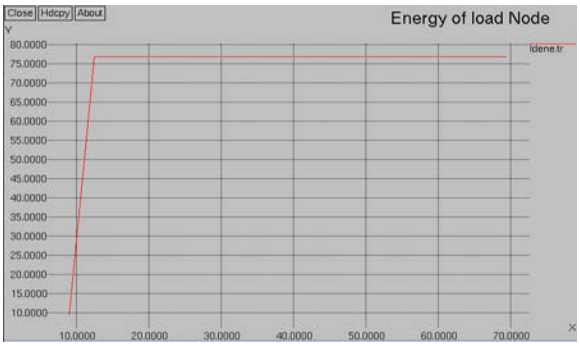
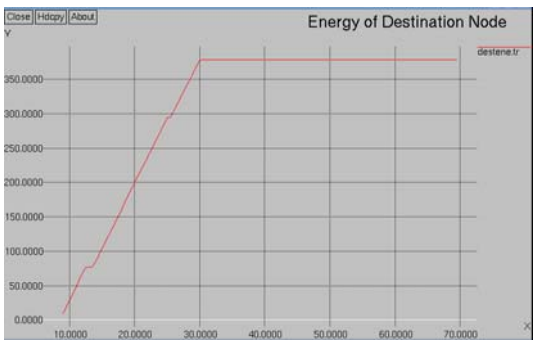



**Figure 5: Energy of Destination Node**



order to the process the load node has varied by means of threshold value. The data has delivered by clusters by means of load node.

## CONCLUSION

In the wireless sensor networks these nodes can operates to limited the battery energy, the efficient energy utilization is very important. One of the main characteristics of the networks is that the transmission power consumption is closely coupled with the route section. The energy efficient method has been considered in the wireless ad hoc network routing, inorder to the conventional routing objective is to minimize the total consumed energy in reaching the destination. In this paper, it's have been formulated the routing problem as maximizing the network lifetime.

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