



# International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: [www.ijirccce.com](http://www.ijirccce.com)

Vol. 4, Issue 12, December 2016

## A Survey on Energy Efficient and Secure Multi Hop Routing for Wireless Sensor Networks

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**ABSTRACT:** Wireless sensor network which is called as WSN is one of the most increasing research domain. Main part of WSN is energy. The main task for wireless sensor networks is reliable routing of data from sensor node to its sink node. WSN consist of group of sensor nodes along with limited memory and set of processors. WSN uses an energy efficient routing protocol. Mobility in sensor nodes and in the BS is considered. This protocol is cluster and hierarchical based. A cluster consist of one cluster head node, two deputy CH nodes, and some ordinary sensor nodes. For selection of the cluster head energy coherency of the sensor nodes, the flexibility of the sensor node and the accessibility to the neighbouring sensor nodes are required. To minimize reclustering time and energy required. CH panel concept is introduced. Depending on the topology of the network transmission of data from CH node to the BS node is carried out either directly or in multihop fashion. Additionally for transmission of data between CH node and the Bs alternate paths are used.

**KEYWORDS:** Energy efficiency, mobile base station(BS), mobile nodes, reliability, routing protocol, wireless sensor networks(WSN).

### I. INTRODUCTION

In wireless sensor network, it consist of sensor nodes which are used for sensing or to sense different physical parameters or for sensing capability in small physical area. These mobile wireless sensor networks are used in many application, like radiology, agriculture and for security purpose. WSN has thousands of sensor nodes that forwards sensory data to the base station. Sensor nodes are limited that's why it has many design challenges. Depending on type of application, the BS is placed far away or in the sensor field. When the sensor node and base station are in mobile state then wireless sensor network are more difficult. Sensor nodes are used for monitoring and they are small in size. Sensor nodes are reasonable. When sensor nodes are in mobile state at that they need more energy. Due to the transmission of more or large amount of data sink node and its adjacent node causes link failure when they are in mobile state.

When base station and its neighbouring nodes are close to each other then they requires low energy for transmission of data. When the distance between sink node and it's contiguous node is increased then relay node can be used for transmission of data between base node and neighbouring node.

The sensor nodes uses battery power and it's not possible to replace battery when sensor is at processing time. In WSN most of the time data loss is occur due to nodes which causes retransmission of data. For this retransmission of data, it requires more energy. Energy coherency is main part of every WSN application.

### II. RELATED WORK

There are so many routing protocols used in wireless sensor networks the main purpose of these routing protocol is authentic data delivery. As well as there are several energy aware protocols have been used for WSN. These protocols are designed by considering sensor nodes and base stations are static. For effective utilization of energy in sensor nodes hierarchical routing is mostly used. Because of neglected behaviour of sensor nodes in WSN energy

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efficiency problem is become a critical point. Most of the protocols which are introduced for WSN do not consider that sensor node and sink nodes are mobile. When mobility is used in sensor node the topology becomes very effective.

Low-Energy adaptive hierarchy(LEACH), threshold-sensitive energy- efficient sensor network(TEEN), adaptive teen(APTEEN), power- efficient gathering in sensor information system(PGEASIS) are examples of energy efficient and hierarchical routing protocols used in wireless sensor network.

LEACH is protocol which is depend on cluster. Each node has rights to choose its own cluster. Basic thing is that collection of nodes called as cluster. In leach cluster head election is based on its threshold value. In this each node has same energy level and that's why they may die at the same time. LEACH is not suitable in large network area.

PGEASIS is a optimal chain based protocol. It transmits and receive to its adjacent neighbour and then transmits to its base station. According to PGEASIS a node passes information to its adjacent node, then data of two nodes combined together and generate a only one packet of data with same length and transmit to its sink node.

TEEN is also one type of hierarchical routing protocol. It is reactive network which means that it determines path when they are necessary. APTEEN is a hybrid clustering based protocol which means that it allows the sensor node to transmit its sensed data repeatedly and react to any change in value of sensed data and send report to its cluster head. Aodv is a ad-hoc mobile network. This protocol creates path only when the node need to transmit data. It generates only one path from soure to destination if the link is failed and there is no multiple paths are available for transmission of data.

### III. SYSTEM OVERVIEW

#### A. SYSTEM ARCHITECTURE:

A novel routing protocol which is called Energy-Efficient and Reliable Routing protocol for mobile sensor wireless network( $E_2R_2$ ) is proposed. The proposed protocol is hierarchical one in which first requirement is to create network then after the creation of network it is necessary to assign energy to the nodes. Then function of source node is to choose Destination node then at the destination it needs to create the path and compare the energy. The path which requires minimum energy that path is called as reliable path. After the selection of the reliable path packets should be sent from that reliable path. Important role of this protocol is to achieve energy efficiency and to provide connectivity to the nodes. The important goal behind such routing is that the data packets need to move through suitable routes in spie of node mobility and in presence of subsequent link failures.

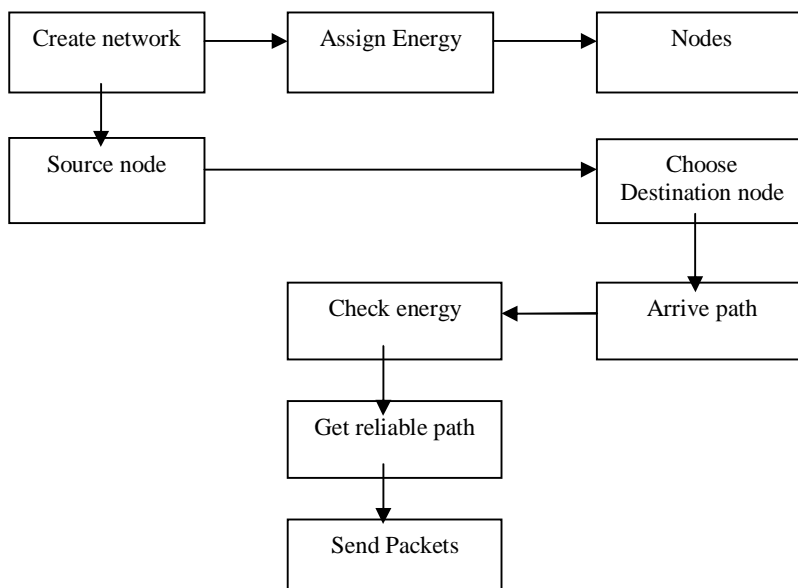


Fig. System Architecture of Energy Efficient and Secure Multi Hop Routing for Wireless Sensor Network



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## B. SYSTEM MODULES:

Followings are the main system modules.

- System Model
- Energy Consumption for Packet Transmission
- Cumulative credit point
- Energy-Efficient Reliable Routing

### System Model:

In the system under consideration, it is assumed that the sensor nodes are all similar in hardware, software, and capabilities (i.e., computing and sensing). Initially, all the sensor nodes have equal amount of energy. After some time of operation, nodes may be left with unequal energy levels. The sensor nodes and the BS are mobile with medium mobility level. A medium mobility level indicates a speed range of the sensor nodes and the BS, which is neither very high nor very low. At the time of implementation, the range may be specified quantitatively. It is assumed that the sensor nodes know their mobility level.

### Energy Consumption for Packet Transmission:

The energy source, i.e., the battery, of the sensor nodes cannot be refueled. In the system under consideration, it has been assumed that there exists only a single BS and that the BS is located away from the sensor field. Although the BS is mobile, it never moves across the sensor field. The energy consumption for packet is given while activating the individual node in the network. This should be a constant value.

### Cumulative Credit Point :

Ideally, a relay node is expected to be equipped with maximum energy level, relative maximum number of neighbours, and minimum mobility level. Thus, one such parameter is not directly linked or correlated with the other parameters. All the three parameters are independent of each other. Cumulative credit point is calculated taking these variables and the calculation is given below

$$\text{Cumulative credit point} = \left[ \frac{\text{Node energy}}{\text{Number of nodes in cluster}} * 100 \right] + \left[ \frac{\text{Number of neighbours}}{\text{Number of nodes in cluster}} * 100 \right]$$

### Energy-Efficient Reliable Routing

This module objective is to find reliable routes which minimize the energy cost. To this end, reliability and energy cost of routes must be considered in route selection. Cumulative credit point is calculated for all possible paths and the route, which is having high cumulative credit point will be considered for routing. Thus make the network, energy efficient and reliable.

## IV. CONCLUSION

An energy-efficient and reliable routing protocol is proposed for mobile WSNs. The proposed protocol E2R2 is hierarchical and cluster based. Each cluster contains one CH node, and the CH node is assisted by two DCH nodes, which are also called cluster management nodes. We analyse the performance of the proposed protocol through simulations and compare with M-LEACH. The proposed protocol outperforms M-LEACH in terms of lifetime and throughput. In the proposed protocol, the throughput improvement is 15% on average over M-LEACH. Such a routing protocol is useful when the sensor nodes and the BS are mobile. This work can be extended to improve the throughput even in the high-data-rate situation, where the sensor nodes generate data at a very high constant rate. The proposed protocol can be also tested under the influence of highly mobile sensor nodes.

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ISSN(Online): 2320-9801  
ISSN (Print): 2320-9798

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