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Various Routing Protocols for optimization of the LEACH protocol in WSN

[1]**Lalita Sharma**
Green Hills engineering college
lalita26april@gmail.com
[2]**Amita Verma**
HOD -ECE
amita.mehta23@yahoo.co.in

Abstract: *Most of the existing routing protocols in wireless sensor networks are designed based on the optimization. But many routing protocols based on clustering method for WSNs have appeared in theprevious works and none of them achieves good results. So the purpose of this paper is to introduce number of routing protocols that has been used previously in accordance with LEACH protocol.*

Keywords: *WSN, LEACH, Routing protocols.*

I. INTRODUCTION

Wireless sensor networks (WSNs), which consist of a number of small battery-powered devices, are frequently to obtain various sorts of useful data from surroundings. These devices sense physical properties, such as sound, humidity, pressure, luminosity, temperature, or chemical concentration and transmit the gathered data to a base station (BS) for further analysis and processing. WSNs have been effective deployed in tactical combat situations, habitat monitoring, home security, and so on [1-5]. Since WSNs consist of many sensors with limited energy, an energy-efficient network protocol is an important consideration in addition to routing in WSN applications. Many routing protocols for WSNs have appeared in the literature. But none of any algorithm is providing good optimization of energy. This paper will conclude previously used protocols for routing optimization in WSN.

II. LEACH PROTOCOL

LEACH stands for Low-Energy Adaptive Clustering Hierarchy [1]. The LEACH Network is through up of nodes, some of which are called cluster-heads. The trade of the cluster-head is to get together data from their instantaneous nodes and exceed it on to the base position [4]. LEACH is vibrant since the job of cluster-head rotates. The LEACH network has two phases:

A. Set-up phase

Cluster-heads can be preferred stochastically (at random based) on this algorithm:

$T(n)= P/1-P* (r\ modp^{-1}), \forall\ n \in G$

$T(n)=0$

Where n is a random number between 0 and 1.P is the cluster head odds. G is the set of node.

- If n < T (n), then that node becomes a cluster head. The high energy cluster head place rotates between the assorted sensors in regulate to not to exhaust the string of a single sensor.
- Each node takes the judgment independent of the additional nodes to become cluster head. It is based on the proportion determined a priori and round digit.

B. Steady phase

Nodes transmit information based on TDMA schedule. Later than information has been recognized cluster head implement signal processing /compression and send to base location. Later than a definite moment a novel turn begins [7]. Major power reduction is owing to combine lossy compression with the information direction-finding and deal among excellence of production and quantity of density ensuing in considerable decrease of overall power indulgence.

III. LITERATURE SURVEY

For optimization, there are many techniques that has been build up.

So use of direct transmission (DT) protocols [6], sensor nodes transmits their sensed data directly to a BS. Thus, the nodes located far from the BS will die quickly since they dissipate much energy in transmitting data packets. DT protocols are inefficient since energy levels of nodes are drained rapidly when the BS is located far. On the other hand, minimum transmission energy (MTE) protocols [7, 8] transmit data packets to the BS by way of multi-hop relay. As a result, nodes located near the BS die quickly since they end up relaying lots of data on behalf of remote nodes DT and MTE result in a poor distribution for energy consumption by nodes. Sensor nodes in some sub regions have all died out, but nodes in other regions are still active. As a result, data for a part of the sensor field may not be detected. Clustering communication protocols represent a superior approach, and result in more balanced patterns of energy use hierarchy was LEACH, proposed in[10,11]. It showed how energy loads could be well amortized by dynamically creating a small number of clusters based on a threshold function T(s) with a priori probability *p* (say, 5%), in a set-up phase. The technique uses cluster heads (CHs) to mediate data transmission. Simulation results in [10, 11] show that all node tend to dissipate the same level of energy over time since the CH roles are rotated among nodes. Although LEACH clearly outperforms the DT and MTE protocols, it retains several shortcomings. Thus several enhanced versions of LEACH have appeared in the literature [12]. LEACH uses a threshold function parameterized by a probability *p* input by user. However, the performance of sensor network is very sensitive to the value of *p*. When *p* is large, many clusters are formed and could result in high energy consumption since many CHs dissipate energy in transmitting to the BS. On the other hand, when *p* is small, only a few clusters are formed, which may increase energy dissipation when member nodes transmit to CHs. The literature suggests that the optimal *p* value *pop*t, or the optimal cluster number *kopt*, depends on parameters such as the total number of nodes distributed in the sensor field, the size of sensor field, the location of BS, and so on [13, 14].

IV. OVERVIEW OF ROUTING PROTOCOL

In order to calculate a defined path between source and destination, multiple Ad-hoc network routing protocols have been proposed in previous years. [14] described that in a network of two or more computers, a set of instructions or a common set of rules is required that each computer should follows to communicate each other. Such a set of instructions or rules is called PROTOCOL. Depending upon the many ways by which computers can communicate, the routing protocols can be divided into three categories .Figure 2 depicts classification of Ad Hoc Routing Protocol.

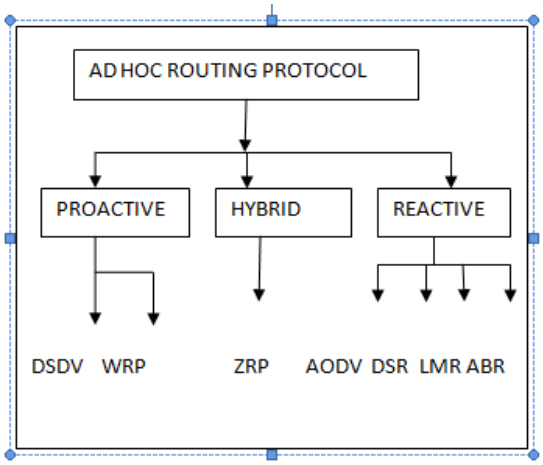

Fig. 1.1: Classification of Routing Protocols

A. Proactive (Table Driven Protocol)

These Proactive protocols maintain the routing information even before it is needed. Routing information is maintained by each and every other node in the network. Routes activity and related information is stored in the routing table and is periodically updated as the network topology changes. Example of this protocols are DSDV (Destination Sequenced Distance Vector), OLSR (Optimized Link State Routing) and WRP.

- **Destination-Sequenced Distance Vector (DSDV)**

It is also called table driven protocol .It was proposed by C. Perkins and P. Bhagwat in 1994,to solve the routing loop problem,. Routes are created for constant traffic control and are available every time, even if there is no communication. Each and every node continuously maintains and updates tables to provide new view of whole network. The disadvantage of DSDV is updating and maintenance of the tables. Improved functions of DSDV have been declared, but a commercial form has not yet been done.

B. Reactive (On Demand routing protocols)

These protocols maintain routing information and its activity at the network nodes only if there is communication. If there is transmission of packet from one node to another then identification of path is done and route is established in an on demand manner. Examples of these protocols are DSR (Dynamic Source Routing) and AODV (Ad Hoc On-Demand Distance Vector).

- **Ad-hoc on–demand distance vector(AODV)**

It is a reactive protocol that reacts on demand. It is a modification of DSDV. AODV has low memory overhead, builds unicast routes from source to the destination and network utilization is less. Since routes are built on demand, there is least routing traffic in the network. When two nodes in an ad hoc network wants to establish a connection between each other, it will build multihop routes. The main advantage of AODV is its least congested route instead of the shortest path. Route discovery and Route maintenance are two basic operations of AODV and it uses Route Request, Route reply and Route error messages for the same. In Route discovery phase, when source node does not have a path to destination, it broadcast RREQmessage which constitutes source and destination IP address, sequence number, hop count and its broadcast ID .Neighbor node which receives RREQ transmits RREP, if it has either path to destination or is destination itself. Source node will transmit data through forward route. In route maintenancephase, when link failure is detected then it transmits RERRmessages to source node. If source node has still data to send then it will reinitiate the route discovery process. RREQ and RREP packet are as described in Table 1 and Table 2.

Table 1: RREQ

Source Address	Source Sequence	Broadcast ID	Dest address	Dest sequence	Hop count

Table 2: RREP

Source Address	Destination address	Destination sequence	Hop Count	Lifetime

C. Hybrid routing protocols

Hybrid routing protocols combine proactive routing protocols with reactive routing protocols. In order to establish the best paths to destination networks, they use distance-vector for more precise metrics and report routing information only when there is a change in the topology of the network. Zone Routing Protocol (ZRP) is an example of a Hybrid routing protocol [13].

- **Zone Routing Protocol (ZRP) [2]**

It aims to address the problems by combining the best properties of both approaches i.e proactive and reactive protocols. It can be classed as a hybrid reactive/proactive routing protocol. The Zone Routing Protocol, suggests, that it deals with zoning concept. A routing zone explains each node individually, and the zones of neighboring nodes overlap. Further, the behavior of ZRP is adaptive. It depends on the current configuration of the network and the behavior of the users. [14].

V. CONCLUSION AND FUTURE SCOPE

Main concept behind the wireless sensors network is to provide good routing so that it works last long enough. This is due to fact that the size of a sensor node is expected to be small and this leads to constraints on size of its components i. e. battery size, processors, data storing memory, all are needed to be small. So any optimization in these networks should focus on optimizing energy consumption as well as routing strategy to enhance WSN life time.

This paper reviews many algorithms for routing efficiency in WSN. The Future scope of this paper includes the use of enhanced LEACH protocols, as still there are many drawbacks in the basic LEACH protocol or use of LEACH protocol with any optimization algorithm.

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