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Abstract-- Wireless sensor networks (WSNs) attract the researchers more these days due to their accepted applications in environment monitoring, radiation and nuclear-threat recognition structure, weapon sensors for ships, battlefield investigation and observation, army intelligence, communications, power, control and targeting systems and biomedical aspects. WSNs can provide cheap solutions to a range of real-world troubles. Sensors are cheap devices with limited storage, computational power. Any safety method for sensor network must be energy efficient as safety is the major concern when they will be used in major applications as sensors have limited power and computational capability and should not be computational concentrated. Here we study the energy efficient secure routing protocol for wireless networks based on data collection we observed in our study following energy-efficient techniques which are EF-Tree (Earliest-First Tree), Designated path (DP) Scheme, and SID (Source-Initiated Dissemination) According to OEERP (Optimized Energy Efficient Routing Protocol), Fuzzy Variables Energy Efficient Clustering Protocol (Fz-Leach). It is a cluster based protocol and Enhanced Heterogeneous LEACH (EHE-LEACH) Protocol for Lifetime Enhancement of SNs. While Sensors don’t take part in the routing plan their energy is preserved at each sensor node.

Keywords-- Wireless Sensor Networks (WSNs), Low-Energy Adaptive Clustering Hierarchy (LEACH ) & Secure Positioning for Sensor Networks (SPIN).

I. INTRODUCTION

In this era wireless sensor networks (WSNs) create a center of attention the researchers further due to their possible applications in weather analysis. The promising field of wireless sensor networks integrate sensing, calculation, and sharing into a private portable device based on the current modifications in micro electromechanical systems (MEMS) technology [2]. WSN can be useful nearly in any environment which calls for observation prior to taking an appropriate action. Development of a wireless system is less expensive and has numerous uses in surrounding monitoring, home building security, bio-habitat observation, disaster organization etc.

Wireless Sensor Networks are categorized into proactive and reactive sensor networks. In Proactive sensor networks, nodes at regular intervals switch on their sensors and transmitters, sense the atmosphere and transmit the data on hand with them.

These proactive sensor networks are appropriate for applications that require data monitoring at standard intervals. Alternatively, in Reactive sensor networks, nodes respond to only some events that occur at their end, like noting a great change in the sensed feature. So, reactive sensor networks are appropriate to deal with time crucial systems. Sensor Networks are generally data centric, in which information are requested based on assured attributes similar to the example in which sensors recording above 100°F report to the enquiry generated by sink. This is unlike from the conventional networks, where information is requested from a definite node.

WSN term can be mostly sensed as devices variety from mobile phones, laptops or PDAs to very small and simple sensing devices. Currently, the majority of available wireless sensor devices are significantly controlled in terms of computational power, memory, competence and communication abilities due to financial and technology reasons. This is the reason most of the study on WSNs has determined on the design of power and computationally proficient algorithms and protocols, and the functional domain has been restricted to simple data oriented observation and reporting uses. Wireless Sensor Network nodes are battery supplied which were implemented to carry out a specific assignment for a comprehensive period of time may be years. If WSN nodes are more powerful or mains supplied devices in the surroundings, it is useful to utilize their computation and communication resources for complex algorithms. New network architectures with various devices and expected advances in knowledge are eliminating current limitations and expanding the range of possible applications for WSNs significantly.

II. ROUTING TECHNIQUES

The energy efficiency can be enhanced using few software algorithms. That route the data as per network and data communication systems. Here we will see different energy efficient routing protocols which will be discussed which are LEACH, PEGASIS and TEEN etc.
Low Energy Adaptive Clustering Hierarchy (LEACH head):

W. R. Heinemann et al [6,7] recommended low energy adaptive clustering hierarchy (LEACH) and centralized LEACH protocol for the data communication from source nodes to the BS through gateways, usually identified as cluster heads (cluster heads). LEACH is set of rules which perform the alliance of nodes into clusters; here local interactions among the cluster members (CMs) are managed by cluster heads. Additionally to this cluster heads have more than a few duties like local information reception, this process can control the energy consumption of sensor nodes and effectively extend the life span of network. Cluster heads are main relying sensor nodes as these are taking the duty of data communication to the base station, dissipate more energy. Therefore the role of cluster heads with dynamism to change such that the high energy consumption in data transmission to the base station is distributed to all the sensor nodes in the system. LEACH -C used centralized approach and considers the remaining energy. The operation of LEACH head and LEACH head-C is controlled by rounds, which consist of two stages setup stage and steady state stage. Cluster heads are selected in setup phase and allocate the TDMA schedule to the respective CMs. While in the steady state phase, data communication between the CMs and the cluster head is performed. A CM in a cluster is active only during its allocated time slot, while cluster heads are active all the time in steady state phase. LEACH head performs periodic cluster head selection; the energy utilization burden of the cluster heads is also shared. The duration of the steady state phase is longer than the duration of the setup phase. Study shows that LEACH head provides a factor of 4–8 reduction in energy consumption compared to a flat-architecture routing protocol. Major disadvantage of this protocol is that they do not consider the residual energy of sensor nodes and assume zero energy consumption for the formation of cluster.


S. Lindsey et al [8, 9] suggested power efficient gathering in sensor information systems (PEGASIS) for the data communication from source node to the BS. This protocol is based on the chain, cluster head is selected randomly from the dedicated chain and accountable for data transmission to the BS. Major disadvantage of this algorithm is that it needs the global knowledge of the network, based on which chain can be constructed using greedy algorithm. There is a proper load matching as a sensor node receive the data from its neighbor, available in the chain, aggregate the same with own data and send to the another neighbor which is the part of chain. Chain will be reconstructed when a node die, now it exclude the die node. Study shows that PEGASIS provides 100–300% lifetime enhancement over LEACH.

Another disadvantage of PEGASIS is the significant delay, since the data have to be sequentially transmitted in the chain and the cluster head waits until all the messages are received before transmitting to the BS.

Threshold Sensitive Ener. Efficient Sensor Network (TEEN):

A. Manjeshwar [10, 11] suggested threshold sensitive energy efficient sensor network (TEEN) and adaptive threshold-sensitive energy proficient sensor network (APTEEN) to provide event based data transmission. Two types of thresholds are used in TEEN hard threshold (HT) and soft threshold (ST). Here sensor nodes are programmed in such a way that it will react to sensed-attribute changes, by comparing the measured value to the HT, if HT exceeded, the sensor node sends it observes data to the cluster head. ST is used to reduce the redundancy in the transmission. Whenever the HT exceeded, the sensor node also checks the ST for resultant observations. Sensor node does not transmit this information, if the difference between consecutive observations does not exceed the ST. Major drawback of LEACH and PEGASIS is that these protocols periodically transmit the sensed information, and are not suitable for the event based data transmission. TEEN is designed to work effectively only for event based data transmission. APTEEN is the enhancement in TEEN and support for the responding periodically. APTEEN provides a TDMA-based structure for the transmission of sensed information to the cluster and each sensor node transmit its information periodically to the respective cluster head. However major drawback of TEEN and APTEEN, there is some situation where data is not transmitted.

As WSNs have been used in wide areas of applications, so routing is significant and need a special attention. Lot of research proposals have been reported in the literature addressing this issue. In this section we cover some existing protocols for the issue we have discussed earlier.

Smaragdakis et al. [12] developed stable election protocol (SEP) for the two level heterogeneous networks, which includes two kinds of nodes, normal and advanced nodes. In SEP election probabilities are weighted by the initial energy of a node relative to that of other nodes in the network.

III. LITERATURE SURVEY

In 2009 Bista, Yong-ki, Jae-Woo [13] worked on a new approach for energy efficient data aggregation in sensor networks. A sensor network is self possessed of a huge amount of sensor nodes, which are supply constraints, like restricted power. A usual concept to collect data by a sink node is to transmit data from sensor nodes to the sink node by multi-hop. It raised two problems first is the hotspot difficulty, in which the sensor nodes closer to the sink run out of energy nearer than other nodes.
As the result, the network lost its service ability, despite of a large amount of residual energy of the other nodes. The next one is that the system generates needless traffic during data transmission for choosing a proper data-sending path. To resolves the problems, authors, propose a new energy balanced and efficient data aggregation scheme for WSNs, called designated path (DP) scheme.

In 2010 Yanwei Xiang-yang Mo, Wei [13] proposed An Energy-Efficient Wake-Up Scheduling for Data Collection and Aggregation. A sensor in wireless sensor networks periodically produces data as it monitors its area. The fundamental operation in such a network is the systematic gathering (with or without in-network aggregation) and transmitting of sensed data to a base station for further processing. A key major challenge in WSNs is to schedule nodes' activities to reduce energy consumption.

This research work focused on deceitful energy-efficient protocols for low datarates WSNs, where sensors consume lot of energy in different radio states (sleeping, listening, receiving, transmitting, and keep idle) and consume energy for state transition.

With the use of TDMA as the MAC layer protocol and schedule the sensor nodes with consecutive time slots at various radio states while reducing the number of state transitions.

In 2010 Arabi, [14] proposed HERF: A hybrid energy efficient routing using a fuzzy method in Wireless Sensor Networks. Authors work giving attention on Data broadcasting is a significant task performed by WSNs. The algorithms of this system depend on a number of factors such as application areas, practice condition, power, and aggregation factors. With respect to these parameters, various algorithms are recommended. An algorithm for hybrid energy efficient routing in wireless sensor networks, which used two algorithms, i.e. EF-Tree (Earliest-First Tree) and SID (Source-Initiated Dissemination) to disseminate data, and employs a fuzzy method to choose group head, and to toggle between two methods, SID and EF-Tree.

Table 1
Summary of Literature Review

<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Title</th>
<th>Methodology</th>
<th>Outcomes</th>
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<tbody>
<tr>
<td>2009</td>
<td>Bista, Yong-ki, Jae-Woo</td>
<td>A New Approach for Energy-Balanced Data Aggregation in Wireless Sensor Networks</td>
<td>Designated path technique</td>
<td>DP scheme is more energy efficient than the existing schemes directed diffusion and hierarchical data aggregation</td>
</tr>
<tr>
<td>2010</td>
<td>Yanwei Xiang-yang Mo, Wei</td>
<td>Energy-Efficient Wake-Up Scheduling for Data Collection and Aggregation</td>
<td>TDMA as the MAC layer Protocols</td>
<td>Reducing the Number of state Transitions.</td>
</tr>
<tr>
<td>2010</td>
<td>Arabi</td>
<td>Hybrid energy efficient routing using a fuzzy method in Wireless Sensor Networks</td>
<td>EF-Tree (Earliest-First Tree) and SID (Source-Initiated Dissemination) According to Fuzzy Variables</td>
<td>HERF has improved energy efficiency.</td>
</tr>
<tr>
<td>2011</td>
<td>Katiyar, Chand, Gautam, Kumar</td>
<td>Improvement in LEACH protocol for large-scale wireless sensor networks</td>
<td>Energy Efficient Clustering Protocol</td>
<td>FZ-LEACH algorithm outperforms LEACH in terms of energy utilization</td>
</tr>
<tr>
<td>2013</td>
<td>Tyagi, Gupta, Tanwar, Kumar</td>
<td>Enhanced heterogeneous LEACH protocol for lifetime enhancement of wireless SNs</td>
<td>Enhanced Heterogeneous LEACH Protocol for Lifetime Enhancement of SNs</td>
<td>EHE-LEACH has better network lifetime than LEACH and SEP</td>
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</tbody>
</table>
In 2011 Katiyar, Chand, Gautam, Kumar, [15] worked on Improvement in LEACH protocol for large-scale WSNs. The LEACH protocol is a hierarchical clustering protocol that provides an elegant solution for such protocols. One deficit that affects the presentation of the procedure is endurance of very large and very small clusters in the network at the similar time. This leads to reduce in life span of WSNs. This research work focused to analyze a new energy proficient clustering protocol (FZ-LEACH ) that eliminates the above problem by forming Far-Zone. It is a group of sensor nodes, and these nodes are positioned at locations where their energies are less than a threshold. The results and study show that planned FZ-LEACH algorithm outperforms LEACH in terms of energy consumption and network existence.

In 2012 Chand, Bharati, Ramanjaneyulu, [16] investigated Optimized Energy Efficient Routing Protocol for lifetime improvement in Wireless Sensor Networks. This research work presents a new routing protocol named Optimized Energy Efficient Routing Protocol (OEERP) that improve the lifetime of WSN. It is a cluster based protocol in which the node that acts as cluster-head is changed in each time period. This way enhances the lifetime of the WSN for two reasons primarily. The first cause is the consistent battery drain of the nodes and the second reason is that no node depends on beacon-based transmissions for long time to reach the contact point. Data sensing and performing data aggregation are also carried out in such a way to reduce the number of transmitted messages to the entrance point. This procedure can be use for any sporadic monitoring application using WSN.

In 2013 Tyagi, Gupta, Tanwar, Kumar, [17] researched on EHE-LEACH : Enhanced heterogeneous LEACH protocol for lifetime enhancement of WSNs. They, focused an Enhanced Heterogeneous LEACH (EHE-LEACH ) Protocol for Lifetime Enhancement of Sensor Networks. A preset distance based threshold is used for the bifurcation of direct communication and cluster based communication in the planned scheme. WSNs near to the BS be in touch straight and those which are distant from the Base use group based communication. To assess the act of the proposed system two key parameters known as: Half Nodes Alive (HNA) and Last Node Alive (LNA) were selected. The distance based selection of threshold with the ratio of 1:9 between direct communication and cluster based communication it has been observed that EHE-LEACH has better network lifetime with respect to various parameters in comparison to the other well known proposals such as LEACH and SEP.

### IV. Conclusions and Future Scope

It has been observed in literature review that Extended Heterogeneous LEACH protocol for wireless SNs the energy efficiency, extended life time and improved system stability make EHE-LEACH an attractive protocol for wireless SNs.

In order to improve the stability of the network system and lifetime Observations show that EHE-LEACH has better lifetime and stability of the system as compared with LEACH and SEP for same energy level. We compared EHE-LEACH with LEACH and other all protocol techniques mention in literature review table but due to the presence of various clustering algorithms that we need to evaluate and in future other factors can have an effect on the network lifetime.

For future work, a model with heterogeneous wireless sensor nodes with its topology to have good energy efficient and increasing lifetime network may be investigated in different future requirements.

### REFERENCES


AUTHOR’S PROFILE

Swati Shamkuwar is research scholar at KNP College of Science & Technology, Bhopal. She is pursuing her M.Tech. in Computer Science Engineering. Her research interests are energy efficient routing protocols in Wireless Sensor Networks.