CLUSTER HEAD SELECTION WITH REDA TECHNIQUE IN WIRELESS SENSOR NETWORK

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Abstract : The use of energy is a major determinant of the longevity of "wireless sensor networks". Energy consumption is critical to network efficiency. The redundant data leads to increased consistency, trustworthiness, and security, whereas eradication assists in sustainable energy because the proportion of the sink node's energy is dissipated in interacting with the data duplication. To maintain the data precision the useful information is to be extracted from redundant data such that less energy to be consumed while data transmission. The data-centric technique is applied in the formation of cluster head while clustering. The REDA technique is applied for removal of flooding and data redundancy for lesser energy consumption while transmission with nodes and cluster head

IndexTerms – **WSN, Clustering, Lech, REDA, Flooding.**

I. INTRODUCTION

The term "WSN" relates to a network with sensor-equipped nodes. In sensor nodes, batteries are the principal energy source. The battery existence determines the distribution network of a sensor device. The primary function of edge devices is network data transmission. Battery consumption is an extremely massive concern in WSN since the data transmission duty demands a lot of energy. Numerous algorithms and regulations are introduced with decreasing energy usage to strengthen the network's operational effectiveness.[1]

1A sensor node's record keeping is the first of three key components.
2. A local system for processing and storing data from sensor nodes.
3. A relaying system for wireless transmission that receives data

WSN Has Issues. WSN faces several difficulties. To maximise the network's benefits, these must be overcome. Following are the three most significant obstacles: Energy Efficiency: WSN uses a minimal source of energy to run. This energy may be utilized more effectively to extend its duration. Battery power powers WSN sensor nodes. Most of the time, batteries cannot be changed or recharged. This issue can be fixed with proper routing, which will also increase network longevity. Security is a crucial concern with WSN. Unauthorized parties may retrieve data. Its prevention is a crucial WSN concern. Data Pairing: To ensure the data coming from multiple nodes, a function such as identifying and removing duplicate data, to minimum or maximum and average, must be used. the real aim of WSN is to convey data to BS as quickly as possible. The delivery of the data packet with the least amount of delay can be ensured by a correct routing protocol. Scalability: For sensor nodes, scalability is essential. A huge volume of nodes will cause the network's performance to suffer. Node thickness and network size are not meant to have an impact on the network's performance. In order to maintain the sensor states in a WSN, routing must be scalable.[9] In general, sensor nodes send position information through the throughput method (BS). The uninterrupted conveyance of data packets to or from a specific node within a unit of time is referred to as throughput. The way CH is distributed is influenced [10] Position of Cluster Heads, too far or too close, is a cause of ineffective energy protocol[11]

1Clustering

Clustering is a tactical transmission system. the main benefit of clustering is to increase energy efficiency and network consistency. Clustering in remote sensor systems is notable and being used for quite a while. Right now, clustering over conveyed strategies is being advanced for managing issues like increasing the life of the network and higher usage of energy. Clustering in the sensor node is required to address a variety of difficulties such as flexibility, quicker energy consumption, and shorter sensor system lifespan. The clustering algorithm restricts the transmission area in groups for data transmission and sends the main essential data to the remainder system through the sending nodes. A grouping of nodes structures cluster and the transmission bridge between cluster members is controlled through a group head (CH)[2]

The Leach protocol contains round. Various round is formed in leach protocol. Cluster arrangement state and regular state are its parts. In a cluster arrangement state, it structures clusters and data exchange in a regular state. The time state is typically longer than the hour of the principal state [3]

(1) In the bunch arrangement stage, nodes achieve whether to transform into a cluster head or not by contrasting and remaining energy.

(2) Some nodes with gradually remaining energy blow some people's minds and send cluster head data to illuminate different nodes. Different nodes with less leftover energy transform into a normal node and send data about joining cluster to a CH head.

(3) In cluster consistent stage, a node in a cluster send information as indicated by TDMA table, and CH heads get, merge, and send information to the sink. After some time, the system changes the CH head choice method in another round.
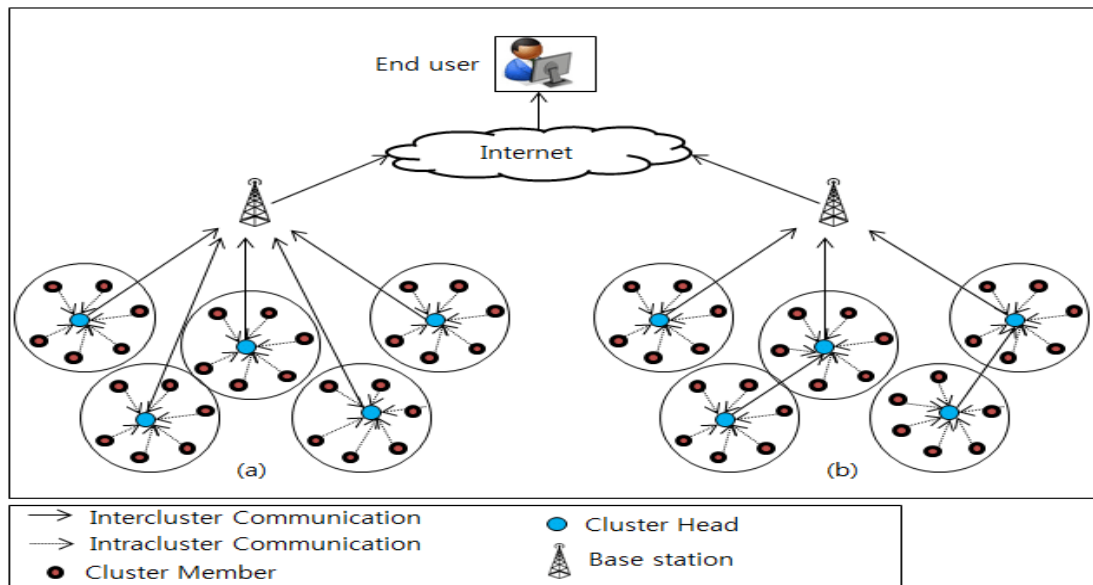

Fig1 Clustering in WSN [6]

2 Leach protocol

The various routing protocol is designed for WSN routing transmission. LEACH protocol (Low Energy Clustering Hierarchy) is between one of them. The system is gathered into the cluster, and the sensor nodes communicate with CH. The choice of a cluster head process is done on a random selection of nodes with higher energy. each node in the network has an equivalent chance of becoming CH. Which form nodes with least energy as CH which results in less network life of the cluster. The transmission between member nodes and CH based on TDMA (Time Division Multiple Access) cluster nodes can send data for transmission within the TDMA provided by CH. The direct transmission base station to the member node is not supported in clustering. [4]

3 Leach Protocol uses

1. The nodes are specifically alike, fixed, and initiated the indistinguishable extent of starting energy.
2. The node consumes energy at a similar level and is skilled to distinguish its outstanding energy and controls power conveying and distance.
3. All nodes can directly bound with each other node, just like the sink.
4. The sink node is resolved and in a good way from the remote system. In this way, the energy consumed by the sink is unnoticed.
5. All nodes have transferred information in every period. The information transmitted by efficient nodes is associated and can be accumulated.[5]

3.1 The problem in Leach Protocol

1. Leach doesn't set the clearness about the sensor node position and the number of cluster heads.
2. Every cluster head promptly bound with the BS, without managing location among it and the BS the energy will diminish in the case of the far distance between CH and BS.

II. RELATED WORK

(W. R. Heinzelman) decrease in power utilization has steadily become a core concern in planning WSNs. The research result has pretended various plans to diminish energy and expand organize life span for real usage of assets. The routing algorithm undertakes an essential job all the while. Cluster assembles a collection of detecting nodes gathers and moves the information to his separate CH head. The CH at that point gatherings the information directs to sink which works as a mediator concerning the finale client and the system. LEACH (Low Energy Adaptive Clustering Hierarchy) is an old-style convention accumulate energy for various levele routing of information [7]

(Liyan Liu, Wei Wu., 2009):In wireless sensor transmission, the energy-saving and time synchronization shows a significant role in sleeping-centered broadcasting. Remaining synchronization time techniques remained not intended for energy competent and centered MAC protocol in WSN as major distress.   energy proficient clustering time management protocol is introduced and the broader concept of node management is merged to synchronization algorithm for a reduction in latency and better performance of the network,[13]

(Tian K, Zhang B, Huang K, Ma J)(2010) The CH gathers the detected information by communication with the cluster nodes called participant nodes. The CH allots TDMA (Time Division Multiple Access) to its comparing cluster members. The participant nodes can spread information throughout the distributed schedule timing. The information is traced for repetition and compacted formerly before directing to the sink. [8]

(J. Xu et al.,2012)LEACH algorithm upgrades the lifespan of the system in contrast with the direct transmission or more than one node transmission but still, it has numerous failures. The cluster heads electing is through arbitrarily which doesn't guarantee appropriate distribution and ideal arrangement[11]

(Jihed Eddine et al., (2014) The basic remote framework structure includes three sorts of center: bunch head (CH), part center points, and move centers. The CHs have the beginning period work to keep up decency of clusters in terms of speed, every so often dispatches the cause to nearest spot of adjoining pair centers in its neighbouring gatherings to hand-off CH to connect the pack. The hand-off CH point ensures the system of Clusters. In any case, it needs to pick one Cluster (or CH) of couple packs it makes the accessibility.[9]

(Djamila Mechta et al., 2014) The development of cluster is concentrated and dependent on the coordinates of the diverse system nodes. Toward the establishment of each round, all nodes send their contact data and their remaining energy to the base station. Since the range of the node is irregular, the node, distant away from the BS, will have issues reporting their data to the BS. [10]

(Kamble et al. 2014) HRP (hybrid routing protocol) protocol section measure of zones, HRP is based on GPS (Global situating framework) grants every node to distinguish its situation before representing a zone with the table to recognize it to which it has an allocated. The quantity of data traded in ZHLS that impacts the control of the transmission capacity. HRP lessen the quantity of data transmitted, subsequently expanding system execution and administration life [12]

(Urmonov, O. and Kim, H., 2018)The routing technique that is planned to work over an information energy loss restoration routing technique that is planned to work over an information accumulation topology operating a TDMA media get to control (MAC)[14]

(Jbcesu et al.,2019) Wireless sensor systems (WSN) are spatially appropriated distinct sensors to configure physical conditions, similar to temperature, sound, pressure, and so on just as to agreeably push through their information through the system to a base station. The WSN is designed of few nodes to multiple nodes. [2]

III. PROBLEM IN EXISTING SYSTEM

1 In existing work, the node centric transmission methods are used, the prime focus of node centric is on the transmission of data packet directed by a specific node as opposed to gathering data packet attributes from a specific node. Information redundancy and message flooding are significant issues while information transmission.

2 The second issue that comes in existing work is how to advance the quantity of cluster head nodes while cluster creating. If there are excesses of CH heads, the size of the inter-cluster transmission will increase. Because of that, information transmission requires extra hops.

The procedure of node centric transmission approaches in the literature efforts mostly on sending data packets that must aim towards an explicit node rather than attaining data packet information from that node. The flooding and redundancy of information are drawback in the network transmission

1. **Flooding and Gossiping**: In flooding the data are carried to the destination node until data is reached. It is easy to implement but the problem of Resource Blindness, Interruption, and Overlap arises in Flooding.

2. **Resource blindness:** The redundant data is transmitted in flooding due to which the energy of network nodes decreases.

3. **Overlapping:** Node C receives the same data from node A and B as they are having an overlapping region as shown in fig2.
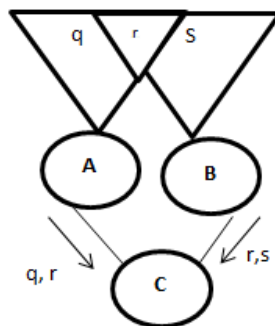

Fig2 Overlapping

4. **Implosion problem**: The same data is transmitted from intermediates nodes in fig3 node A sends data to its neighbor and Node D get the same data from Node C and B.
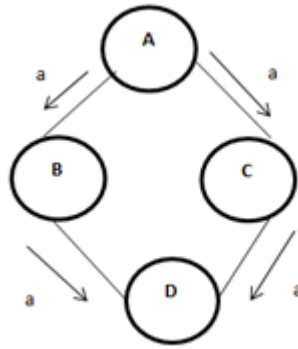
Fig3 Implosion

5. **Gossiping:** In this algorithm, the random intermediates nodes are selected for packet transmission and these randomly select nodes further select random nodes for packet transmission.

IV. PROPOSED METHODOLOGY

Redundancy elimination data aggregation (REDA): The proposed technique use clustering protocol .in clustering technique. Clustering algorithm work in two stages

1. **Cluster formation**: the several nodes are used for assigning CH. The several nodes are segregated as standard nodes and higher energy nodes are considered as CH. CH aggregate data transferred from regular nodes formerly sending to BS. To stable the power depletion of the overall network CHs are reformed dynamically established on the left over energy

2. **Steady Phase:** data transmission between cluster head CH and normal nodes is part of steady phase .The CH aggregates data sent from normal nodes to BS. The pattern code generation method is used for eliminating similar data aggregation. The CH generates pattern codes and execute on entire sensor node to create pattern codes Specific to sensed data. This data is presented as a Set of numbers. The range of numbers can be separated into interims which depend on the network requirements
   1. The CH generates a look up table, as when clusters are formed in the network, sensor nodes receive pattern codes generated from its corresponding CH
   2. For first time (T = 0)   sensor node contains its precise parameters and by referring to the look up table, it compares its pattern code and forward it to the subordinate CH.and CH forward non repetitive data to BS eliminating data with same pattern
   3. For next iterations (T > 0), for every node calculates its new pattern code and compare it with the last one. For similar, the node keeps its data and do not transmit it to CH. Otherwise, the data will be conveyed to CH.[15]

V. Result and Discussion

1Network Life: The table1 and figure4 show the comparative analysis of various Node centric and Data-centric techniques. The comparison table shows that flooding protocol has least network life and Node of REDA algorithm in 1400 round and the last node died in 2500 round which shows that it has more network life compared to another algorithm. Thus, energy consumption REDA is less as compared to another algorithm

Table1 Network Life Comparison

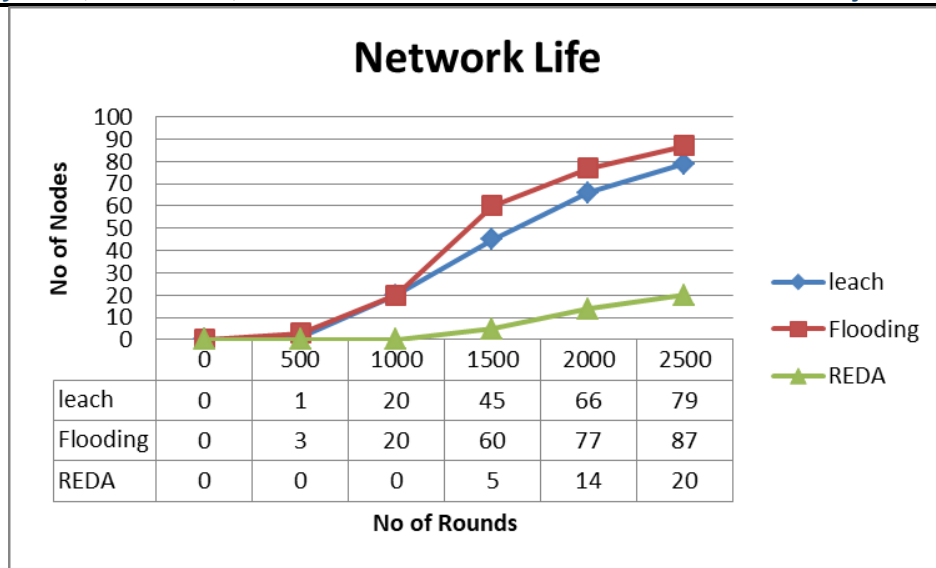| Rounds	leach	Flooding	REDA
0	0	0	0
500	1	3	0
1000	20	20	0
1500	45	60	5
2000	66	77	14
2500	79	87	20

Network Life

No of Rounds	0	500	1000	1500	2000	2500
leach	0	1	20	45	66	79
Flooding	0	3	20	60	77	87
REDA	0	0	0	5	14	20

Fig4 Network Life Comparison

2Energy Consumption: The table and figure show the comparative analysis of various Node centric and Data-centric techniques. The comparison table shows that residual energy of SPIN is better than leach and R-leach protocol but REDA has the more efficient residual energy level. This protocol will increase.

Table2 Energy Consumption Comparison

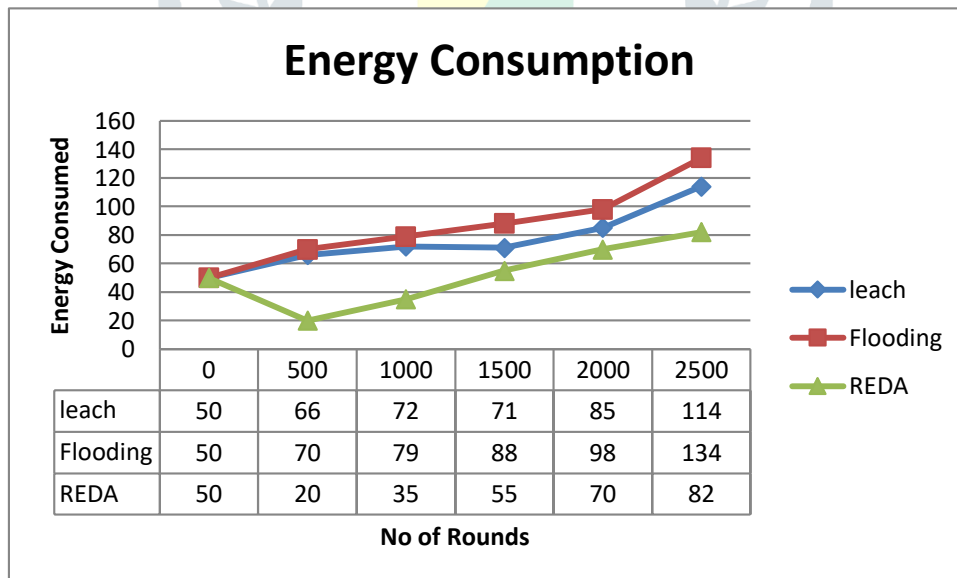| Rounds	leach	Flooding	REDA
0	50	50	50
500	66	70	20
1000	72	79	35
1500	71	88	55
2000	85	98	70
2500	114	134	82

Energy Consumption

No of Rounds	0	500	1000	1500	2000	2500
leach	50	66	72	71	85	114
Flooding	50	70	79	88	98	134
REDA	50	20	35	55	70	82

Fig5 Energy Consumption Comparison

VI. CONCLUSION

The evaluation analysis of different data-centric algorithm protocol shows the evaluation individualities of several algorithms. The comparison shows which protocol results are better on energy depletion and altered situation. In energy consumption, REDA has less energy consumption as compared to another algorithm, and Flooding and gossiping have high energy depletion to other protocols. On the analysis comparison of the various algorithm the proposed methodology of research work will be designed from the analysis of the above technologies for the elimination of duplicate data and flooding problem in Cluster-based sensor Network for increasing the lifetime and decreasing energy consumption while transmission in network.

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