Review Wireless Sensor Routing by optimization of Cluster Head

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Abstract-The WSN network is explained under the feature guidance at node as well as network level. The network is explained with variable position as well as fixed position scenarios. The location of nodes is explained under mobility guidance and narrow range setting under the implication of stability [10]. The network is explained under the limitation of route identification and volume limit guidance. The network is explained under the node neighbor identification that can identify the efficient next hop to create the effective communication route over the network system. The hop recognition can be finished
with the range and other parameters guidance.

Keywords— *WSN;cluster;optimization.*

I. INTRODUCTION

Wireless sensor networks are the application based networks which comprise of various sensor nodes. WSN is an arrangement of many sensor gadgets which speak with wireless networks with the assistance of restricted vitality expending steering conventions. Wireless Sensor networks are thick wireless networks of little, cheap, low-control, disseminated self-ruling sensors which amass and proliferate natural information to encourage checking and controlling of physical conditions from remote areas with better exactness. For the most part, it is accepted that every sensor in a system has certain limitations as for its vitality source, power, and memory and figuring capacities [1, 3]. It contains a door that gives wireless network back to the wired world and dispersed nodes. It can likewise be characterized as a system of gadgets that can impart the data accumulated from an observed field through wireless connections. The information is sent through different nodes with an entryway and the information is conveyed to different networks like wireless Ethernet. These networks are utilized to control physical or ecological conditions like sound, weight, temperature and so forth. WSN nodes have constrained battery limit. To build the life expectancy of WSN the usage of vitality in a productive way is a most normal issue [2]. As the utilization of WSN are expanding step by step and has numerous varieties like target following condition observing, air contamination checking and so on. These applications require fast correspondence between sensor nodes.

1.1 WSN Architecture

There are three main components in WSN: nodes, gateways and software. Spatially distributed cluster heads interface with sensors to monitor assets. The collected data transmit to gateway wirelessly, and can operate independently. It is connected to a host system where the data can be collected, processed, analyzed and presented by using software. To extend WSN distance and reliability, special type of measurement node is used such as router node. WSN is a widely used system because of its low costs and high efficiency. Wireless sensor networks (WSN) contains sensor nodes which basically utilized for detecting, imparting and information preparing. Sensor nodes can be utilized as a part of numerous fields like businesses, military, and farming applications, for example, transportation activity checking, natural observing, keen workplaces and front-line observation. In these applications, sensors are conveyed in a specially appointed way and work independently. In these unattended conditions, these sensors can't be effectively supplanted or energized, and vitality utilization is the most basic issue that must be considered [4, 5]. The sensor is a small device which is used to detect the amount of physical parameters, event occurring, measures the presence of an object and then it converts the physical parameters to electrical signal values using electrical actuators.

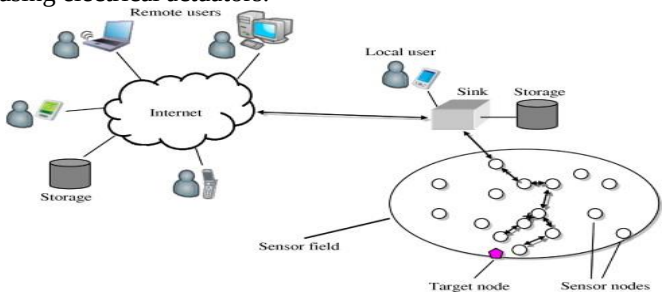

Fig.1:WSN Architecture

1.2 Types of WSN Topologies

The different types of network topology are used for the development and deployment in wireless sensor network that are tree, bus, ring and mesh etc.

A. *Bus Topology:* In this topology the node sends the message to another node on the network and all nodes are able to see this message but only the actual recipient node accepts and processes the message [3]. This topology is

easy to install when the resources and nodes are in limited amount but the congestion in increased due to single path of communication.

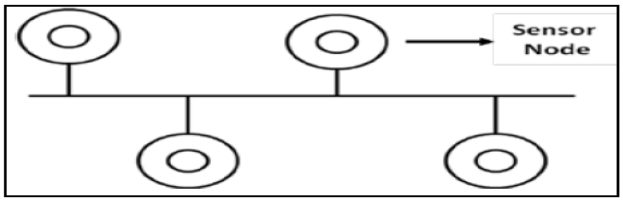

Fig.2: Bus Topology [11]

B. *Topology:* In the tree topology the central root node is worked as a router and selects the route for all the nodes. The central hub in this topology is just one level below the root node. The lower level of the topology is worked like a star topology and it is considered as hybrid. This topology worked as single and multi-hop and data is send by the central hub to the sink nodes.

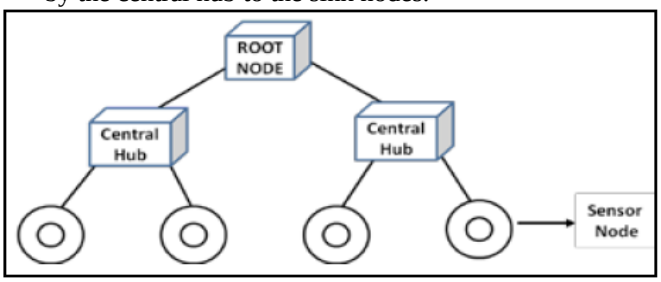

Fig.3:Tree Topology [11]

C. *Star Topology:* In this topology the sensor nodes are connected to the sink node and send the data through it. The direct communication of the nodes is not possible in this type of topology. The data sharing in this topology is easy due to a central communicator but if the sink node is fail then the whole network is not working and a condition of jamming is performed on network [7].

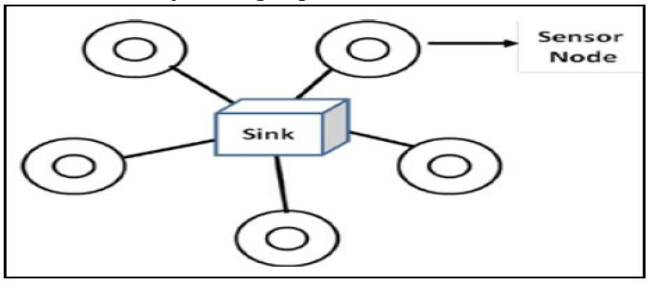

Fig.4: Star Topology [11, 13]

D. *Ring Topology:* In Ring topology each node has two neighbor nodes and the communication in ring topology is performed in always one direction. The direct communication between the nodes is not possible in this topology because all the nodes are connected through a loop. If the single node is failed in this network then the communication between the all nodes is stopped completely.

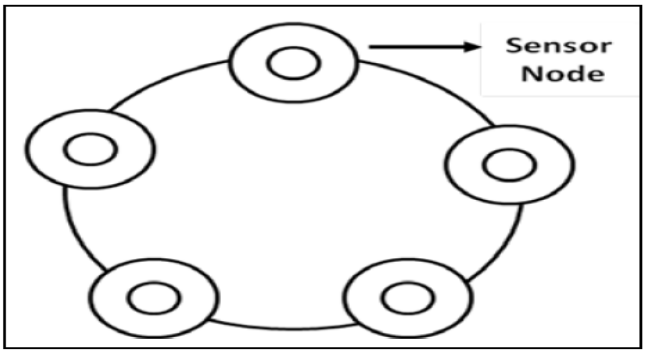

Fig.5: Ring Topology [11]

E. *Mesh Topology:* In mesh topology every node is connected to each other and able to share the data. Many paths are available between the sources and sink if the one path is failed due to some reasons then the communication does not affected and other path is taken by the nodes.

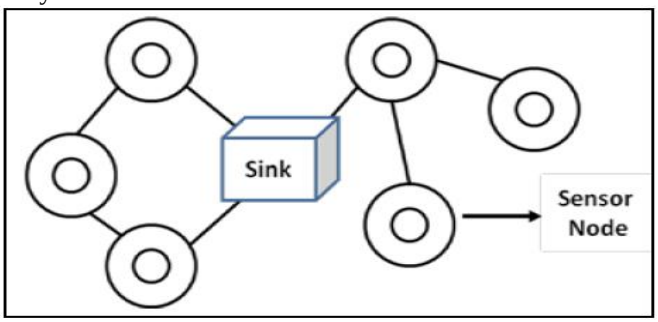

Fig.6: Mesh Topology [11]

F. *Circular Topology:* In circular topology the sensing area is defined by the tiers in which sensing nodes and random nodes are deployed for the communication. The sink node is available at the center of the network. This topology is easy to maintain, easy to deploy and more efficient than other topologies.

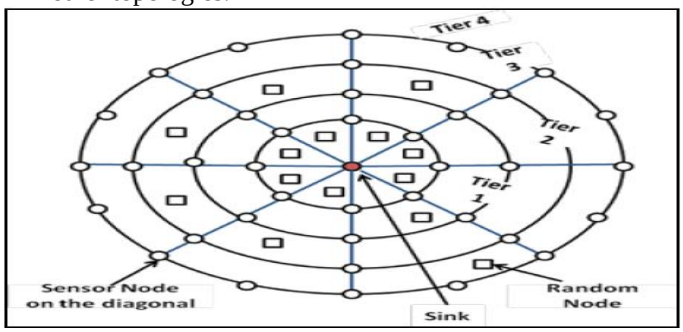

Fig.7: Circular Topology [11]

G. *Grid Topology*: In this topology the network is divided into the equal sizes grids that are non-overlapped and square in shape. In each grid at least one node is working at the anytime. Each grid has a node head which is responsible for sending the information to the other node related to routing and data transmission. This topology is

fast among all topologies and congestion is not possible in this topology due to the grids structure.

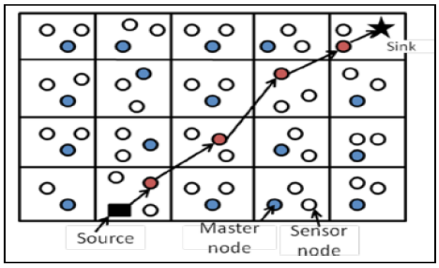

Fig.8: Grid Topology [11]

1.3 Advantages and Disadvantages of WSNs

A WSN consists of a large number of low power multifunctional sensor nodes, [9] operating within the unattended environment. WSN has various advantages and disadvantages as listed below.

*1) Advantages***:**

a) Without permanent framework network setup can be done.

b) Ideal for the non-accessible places

c) Ad-hoc when the situation requires an additional workstation.

d) Cheaper and economical.

2) Disadvantages:

a) Less storage capacity (100 KB) and modest processing power.

b) Consumes large power and works in short communication range.

c) Less energy is provided by the devices.

d) Low speed than wired networks.

e) Easily impacted by the atmosphere.

II. ROUTING APPROACHES

The WSN network is explained under the feature guidance at node as well as network level. The network is explained with variable position as well as fixed position scenarios. The location of nodes is explained under mobility guidance and narrow range setting under the implication of stability [10]. The network is explained under the limitation of route identification and volume limit guidance. The network is explained under the node neighbor identification that can identify the efficient next hop to create the effective communication route over the network system. The hop recognition can be finished
with the range and other parameters guidance.

2.1 Routing Approaches

The routing approaches adapted by different mobile network are shown and discussed. These approaches are given below fig.9

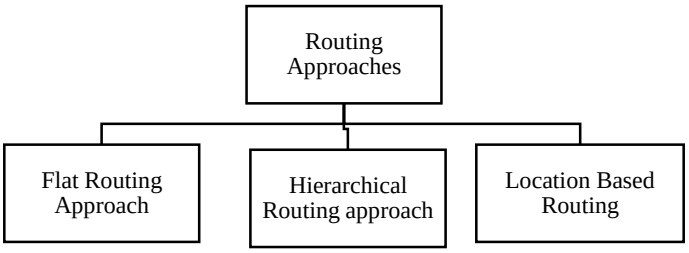

Fig.9: Routing Approaches

A. Flat Based Routing: Such kind of routing technique is used in identical network with randomized parameters guidance. All the network nodes are of same type and the multi hop route is used to optimize the network route. In most of the intra- cluster mobile network, these kind of routing approach is been used to carry out the network communication. This routing approach works on the destination adaptive and data adaptive communication carried out over the network. The network also has the multi case communication to minimize the communication effort. To carry out the multi cast communication aggregative communication approach is adaptive in these networks. Such kind of routing technique also requires minimizing the number of intermediate nodes as well as minimizing the communication effort of each involving node over the network. Such kind of communication route read the next neighbor under different physical and communication parameters and choose the node with effective throughput and minimum expected loss and delay [6, 12]. The work is about to minimize the flooding by capturing the routing information as well as minimize the redundancy in communication. The work is also effective to carry out the broadcasting of the network as well as effective hop selection over the network.

B. Hierarchical Routing: In this routing technique, the inter cluster communication is carried out. The nodes can identical or different but the nodes in a same network are considered as identical. The network area chosen in this network type is generally big and measurable. Each sub network is explained under the guidance of controller node so that the effective network aggregation will be carried out by the node. This controller node takes the adaptive decision regarding the node guidance and the sub network head specification. The segmented communication is made in the form of tree and at each tree node decision regarding the adjacent network election will be done [7, 14].

C. Location Based Routing: The routing technique explained here for the guidance of network node and tracking of node under the location guidance and creation. This routing technique relies on the node location and the signal strength of various positions over the network. The

satellite guidance is used to select the position of the node and to carry out the activity of the network under guidance of protocol. GPS analysis is carried for node location monitoring and indication to select the node and to perform the zoning of the network with guidance of the criticality for the network with specification of routing and mobility.

2.2 Classification of Ad hoc Networks Routing Protocols

Routing protocols in Ad hoc Networks are divided into three types depending on their functionality and way of working in the network. Below given fig.10 shows the routing protocol [1, 2].

a. Reactive protocols; b. Proactive protocols; c. Hybrid protocols

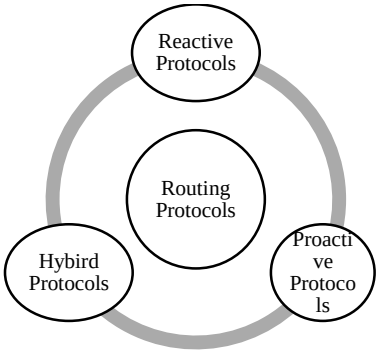

Fig.1.10: Shows the Routing Protocol

2.3 Existing Issues

The existing issues are illustrated in the section below:

Routing: Routing is the main problem which occurred in the wireless sensor networks and many solutions has been developed to solve this issue. For providing effective routing WSN faces many challenges due to its flexible changes in nodes [8, 9]. These difficulties block existing directing conventions created for wireless specially appointed networks from being utilized as a part of WSNs.

Energy Consumption: The main goal of this research is to provide the energy efficient routing protocol. These protocols are used to provide efficient data transfer between sensor and the sink. In the development of the protocol energy consumption is the main concern because the energy resources of sensor nodes are limited.

Neighborhood discovery: Mostly the routing protocol requires each node to exchange the data between its adjacent nodes. The exchange of information changes according to the routing method and the location of the nodes. In data centric routing protocol may require the information content of the observed value of each sensor in its nearby nodes.

Scalability: Wireless sensor network is consists of huge number of nodes in it. High- density deployment of nodes required physical phenomena to observe. In this each node contains a lot of information and supports the distributed network topology. In this scalability is the main issue in wireless sensor network. If the density is high in the network then it exchanges the data in limited amount for energy efficiency [13].

III. LITERATURE REVIEW

Swain et al. [1] work on the diagnosis of fault in the wireless network and proposed a protocol for it named as Heterogeneous Fault Diagnosis Protocol. This protocol consists of three phases that are clustering phase, fault detection phase, and fault classification phase. This method detects the faulty nodes and classification is done by using probabilistic neural network protocol. The simulation result of the proposed method is tested on NS-2 simulator. Huang, Haojun, et al. [2] proposed an energy-efficient multicast geographic routing protocol (EMGR) to provide the efficient and scalable wireless sensor network. It is a multicast tree which formed by the set of destination and the source node based on the energy. This protocol reduced the energy consumption, computational overhead and enhance the packet delivery ratio. Kumberg, Timo, et al. [3] proposed a simple and effective cross-layer routing protocol called as T-ROME. In this nodes are containing wake up receivers. This by the protocol used to save energy skipping nodes during data transfer. In this protocol, Markov chain model is also used for verification. This protocol enhanced the performance of the wireless sensor network. Krishna et al. [4] uses sensor- media access control protocol and Leach to provide energy efficient wireless sensor network. In this method, Leach is used for adaptive clustering of the nodes in remote sensor systems. This method uses TDMA based MAC convention to adjust utilization. In these work different types of Leach is also used to enhance the performance. Tan, Cheng Kiat, et al. [5] introduced FAEM data collection protocol which is used for energy efficient multicast multichannel routing in wireless sensor networks. It works on the basketball net topology in which it establishes a table for each node and also pre-assigns the channel which is different from the neighbor nodes. Time is divided into duty cycle and each cycle consists of two phases. The first phase called iterative scheduling phase and second phase called as slot-based packet forwarding phase. In this network tree upload nodes are called parent node and download nodes are called child node. Results of the proposed method give low energy consumption, low latency, and high data reliability. Bahbahani, et al. [6] proposed cooperative clustering protocol to enhance the longevity of energy harvesting based WSN. It maintains the energy consumption between the cluster heads and nodes according to the duty cycle. In this TDMA approach is used with the cross-layer approach. Performance of the proposed system is analyzed by using parameters bandwidth utilization, latency, and energy consumption. Saleh, Ahmed et al. [7], Sen, GB Zionna et al. [8] introduced the Multi-aware Query Driven routing protocol

for wireless sensor network which is based on the neuro-fuzzy system. This protocol focused on the life of the sensor, delay transmission of data and total cost of network and path on the network. Fuzzy rules are used to select the proper path. The performance evaluation is done by comparing the proposed protocol with the existing and it provides best data delivery with minimum routing overhead. In Rumor Routing is proposed with fuzzy logic to reduce the energy consumption. It works on the three factors centrality, energy, and distance. Network efficiency is enhanced by using this approach. Kulshrestha et al. [9] introduced an adaptive energy balanced and energy efficient approach for data gathering in wireless sensor networks. This method considers the neighbor nodes and link reliability to determine the energy consumption on nodes. This mechanism reduced the end-to-end delay and energy consumption in the wireless networks. In this work, the author uses Forwarding approach to reduce the excessive overhead in the multi-hop network. The result of the paper shows that it reduced the message overhead, energy consumption, and end-to-end delay. Zhang, Xiaoying, et al. [10] Energy efficient MAC protocol is proposed for wireless sensor networks. It works on the basis of best partnership selection algorithm which considers the energy consumption during the data transmission. It checks the total power allocated to the senders to transmit data packets. This protocol gives congestion free network and nodes consuming low energy. Bouachir, Ons, et al. [11] introduced EAMP-AIDC energy-aware protocol which works on the basis of duty cycle optimization. Duty cycle considers the active and sleep periods of the nodes which are used for balancing of the nodes. This experiment is performed on OMNET++ and gives better energy consumption and enhanced the energy savings over the network. Hong, Chao, et al. [12] proposed hybrid beaconless geographic routing. In this approach data packets are divided into two type of packet that are normal packets and delay sensitive packets. It uses two kind of handshake mechanism for delay sensitive packets that are request to send and clear to send. Priority method is used for the channel assignment. The analysis of the proposed approach shows that delay sensitive packets have lower latency and higher packet delivery ratio and low energy consumption. Doudou, Messaoud, et al. [13] Cascading wake-up MAC protocol is proposed low power wireless sensor network. This work mainly focused on energy/delay, optimization and switches between two modes on the basis of traffic type and delay. First mode is high duty cycle and second mode is low duty cycle these modes are used to adjust the wake-up nodes according to load. The proposed MAC protocol is compared with existing protocol and it performs better in energy saving and data delay reduction.

Table.1: Literature Inferences

Author's Name	Year	Algorithm/Method Used	Effects on WSN
Swain et al.	2018	Heterogeneous Fault Diagnosis Protocol	Work on the diagnosis of fault in the wireless network and proposed a protocol for it named as Heterogeneous Fault Diagnosis Protocol. This protocol consists of three phases that are clustering phase, fault detection phase, and fault classification phase.
Huang, Haojun, et al.	2017	Energy-efficient multicast geographic routing protocol	Proposed an energy-efficient multicast geographic routing protocol (EMGR) to provide the efficient and scalable wireless sensor network. This protocol reduced the energy consumption, computational overhead and enhance the packet delivery ratio
Sen, GB Zionna et al.	2017	Fuzzy rules	Introduced the Multi-aware Query Driven routing protocol for wireless sensor network which is based on the neuro-fuzzy system.
Bahbahani, et al.	2017	TDMA approach	Proposed cooperative clustering protocol to enhance the longevity of energy harvesting based WSN. It maintains the energy consumption between the cluster heads and nodes according to the duty cycle.
Zhang, Xiaoying, et al.	2017	Energy efficient MAC protocol	Energy efficient MAC protocol is proposed for wireless sensor networks. This protocol gives congestion free network and nodes consuming low energy.
Doudou, Messaoud, et al.	2016	MAC protocol	Cascading wake-up MAC protocol is proposed low power wireless sensor network. This work mainly focused on energy/delay, optimization and switches between two modes on the basis of traffic type and delay.

Zhuo, Shuguo, et al. [14] introduced i-Queue MAC a hybrid protocol which supports the CSMA and TDMA in variable traffic. When the load is light on the WSN then it uses contention based CSMA and transfer data with low delay and scattered transmission. When the traffic is high on WSN then it uses contention free TDMA mechanism and allocates the transmission slots. The proposed method reduced the packet buffering and packet delay by combining TDMA and CSMA. This method works effectively on single and multichannel modes.

IV. CONCLUSION

Wireless sensor networks have gained a lot of attention is the last few years and used by the peoples in various applications and also in the military services. In WSN it is very challenging process to design a robust and scalable routing protocol which performs well in the time of data congestion

on network. In the proposed work particle swarm optimization algorithm is used to provide the optimal result in the nodes of WSN. GWO work on the biological behavior of the swarms provides effective solution. In this work GWO is used for selection of cluster heads according to their size. It works on the alive nodes, dead nodes and the energy consumption by the nodes. The results depict the GWO performs better than the existing approach IPV6 LEACH and Leach in every scenario.

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