Energy Efficient Routing Protocol Design for Wireless Networks

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Abstract - Nowadays the Wireless Sensor Network in gaining the importance in daily working or in different industries. The WSN is mostly used in communication and energy related industries. The Sensor Nodes are sense the data and information. Then it is process the sensed data to transfer this data and information to base station using radio frequency (RF) channel. This technology is important in the monitoring and tracking system. To improving the life of sensor and battery, it is necessary to scheme energy efficient routing protocol which can eliminate the entire problems that decreases the efficiency of WSNs. This innovation paper represent that several problems associated to energy efficient routing protocol for WSNs. If any node runs out of power, the entire network connectivity collapses and intend of the deployment might become futile. Because of this reason most of the research in the area of WSNs has concentrated on energy efficiency where the design of energy efficient routing protocols plays a major role. This research work titled "Energy Efficient Routing Protocols for Wireless Sensor Networks" proposes to implement energy efficient routing vii protocol scheme so as to enhance the lifetime of the WSNs.

Keywords: - Wireless Sensor Network, Radio Frequency, Sensor, Energy Efficient, Routing Protocol.

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I. INTRODUCTION

The WSNs (Wireless sensor network) existing of multiple devices and sensors used to monitors physical environment conditions. In this network every node or sensor having routers and gateways to create WSN system. Centralized gateway connect all the nodes in the network, its establish connection between network nodes wirelessly (Singh; et. al., 2017). We can establish long distance and reliable connection with help of routers. This functional diagram in figure 1 is shows modular design framework which supplies the versatile and adaptable platform for the represent the various application needs.

For the deploying the sensors in the network field the signal conditioning block can be reprogrammed or replaced. Wireless sensing node uses the different of sensor (Rajgor, et. al., 2018). As per the given application the requirement of radio links may be swapped. For the bidirectional communication these application needs wireless range (Bhushan & Sahoo, 2017).

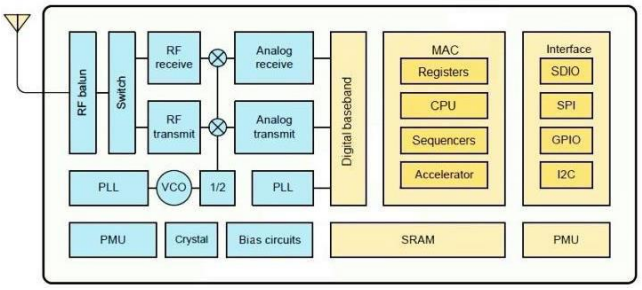

Figure 1: Block Diagram of WSNs.

For acquiring data from base station remote nodes used flash memory (Vinutha, et. al., 2017).

Microprocessor having following functions:

- Collecting and managing data which is collected from the sensor.
- Perform the power management function on it.

- ► It is used as the interface between the sensor data to the physical radio layer.
- ► To handle the protocol of radio network.

The main function of the any sensing node is to use the minimum energy by the network. Radio subsystem commonly need to huge amount of power. So it has benefits to forward data using the radio network only when we needed. This sensor are also has the event driven based on data collection and send model and it requires algorithm for when data is to be send on the depends on the sensed function and this algorithm is loaded in to the node. Sensors should be consumes minimum power it is very important (Lakshmy & Sindhu, 2017). Now a day's new wireless transceivers for wireless devices comes into the market which are reduced in size, less power consumption, minimum expensive, Small size antenna. New sensor having good battery backup and these batteries are rechargeable from solar system or vibration energy. For the WSN monitoring there are three sensor nodes these are the sensor nodes, routing data acquisition and processing H/W and sensing auditing station are utilized. The sensor node is responsible for monitoring the physical environment and generate alert about illegal activities to the administrator (Kumar & Sarvagya, 2017). It used the sensing algorithm which is used to detect the attack in the system. In the network field many sensors scattered, every sensor node having battery power which used to detect attacks. These batteries are rechargeable automatically like solar system. These sensors tiny in size and inexpensive and we can easily place in the network field. Sensor doesn't have any IP address for identification it's having own identifier which is capable to identifying themselves. When any sensor node lost his battery power this will automatically eliminates from the network (Abedin, et. al., 2017).

The wireless networks like WSN is a set of number of small tiny sensor nodes. In WSNs, the sensor node is resource restrain. The restricted resources of these sensor nodes are fundamentally battery power, memory necessary for data storage etc (Rajgor, et. al., 2018). Since this enable researchers to work on resource restrain WSNs objectives of achieving the efficiency of using these resources. Multiple numbers of routing protocols are developed by various researchers with objectives of obtained the better efficiency in WSNs. In WSNs, the security is a significant factor. So, while a supply the data security, energy consumption is necessary to be reduces so that lifetime of WSNs network is expands. The security techniques is efficiently representing via the routing protocols. It means that routing protocol should supply the security while obtained objective of efficient energy consumption (Bhushan & Sahoo, 2017).

In the Section II we study on "Literature survey". "Analysis of comparative" tables are displayed in Section III and "summary and conclusions" in Section IV.

II. LITERATURE SURVEY

In this section, different techniques of Energy Efficient WSN are discussed and analysed. Basically we present study Energy Efficient Routing Protocol for Wireless Sensor Network techniques.

Vikas Singh, et. al. (2018)

In [1] WSNs are largely using the terms of heterogeneity to increasing the throughput, stability and network lifetime. Multiple nodes methods on the terms of heterogeneity are explore that mainly concentrates on the energy efficiency, clustering procedure, stability and network lifetime. We investigated the SEESH (Sleep-Awake Energy Efficient Super Heterogeneous) protocol. The SEEDH protocol envisions four levels of various in simultaneousness with the mix of nodes. These nodes are sent in four energy levels place to manhandle differing at higher. The mix of hub, one hub marginally and give the energy sets while the other node expanding and exchange the information to cluster head. The cluster heads in each segment are gathered in the light of ordinary energy of each four energy districts and remaining energy of nodes. The output are check and speaking to using MATLAB.

Mansi Rajgor, et. al. (2018)

In [2] the author is focuses on WSNs are very spent by low energy due to their environment of transmission. Recently, analysis for WSNs has incited numbers of routing scheme that usage the restricted assets accessible at sensor nodes all the more efficiently. Diverse routing protocols are developed in the speaking to as head way to improve the lifetime of WSNs. These plans by and large endeavour to find the base energy usage at a hub. The purpose of this examination is to develop consequently a protocol for multi-node routing in which nodes forwards route request for packet probabilistically. The author's innovated system enables the remote nodes of the system to modify their energy with a specific end goal to upgrade the lifetime of the WSNs. The innovated calculation is accomplished in QualNet test system. Reproduction tests are performed to investigations and look at the after-effects of innovated PEER (probabilistic energy efficient routing) techniques with protocol AODV and with other energy efficient routing protocol EEAODV. The output that PEER supplies better execution regarding battery limit with lesser sending of route ask for packets.

Bharat Bhushan, et. al. (2017)

In [3] the WSNs consisting of multiple numbers, tiny, multi-operational sensor nodes for mix of data and data from different destination area or detecting fields. The WSNs can be use for different applications along these lines space exploration, health-care auditing, environment monitoring, military innovation and disaster management etc. these are likewise underpins for applications where regular wired and remote systems can't be conveyed.

Data transmission in WSNs isn't straightforward work because of asset depleted nodes, restricted battery time, low transmission control and so on. Energy is the urgent qualities in WSNs for detecting information to the goal. WSNs are utilized as a part of aggressive and detecting area making them open to different kinds of security assaults. In this plan of WSNs routing protocols must be investigation different routing issues and setup issues. The examinations represent to different information blend strategies and productive routing protocols to decrease the network energy utilization. This paper investigated that, the different routing difficulty and furthermore the restriction of WSNs. It equivalently supplies a node by node description of four types of routing protocols are, location-based, multi-path based routing, hierarchical and info-centric. Several open research problems are contributed recorded alongside the conclusion.

C. B. Vinutha, et. al. (2017)

In [4] the potential development and strong confluence of various innovations like Wireless communication, MEMS (micro electro Mechanical systems) and Digital electronics have expect to see the concepts of sensor networks with the satisfying endeavours of massive controlled, simple and smaller determined sensor nodes utilized for short separation, multi-node communication. Proficient utilization of nodes battery energy to increasing the network lifetime is the basic issue in WSNs [5]. The irregular control hail overheads traded between the base station and the sensor nodes consolidate liberal measure of weight in energy use. The other proficient energy issues lies in separate and the accompanying retransmissions, while obliging the control hail overhead charges. To coordinate this issue, we propose the set format of non-uniform examining and solid directing for reasonable energy usage and quick information correspondence in the framework while limiting control hail overhead charges. Our work upgrades the constant quality in packet transmission by foreseeing energy excited and close to nodes in the information sending way towards the target, utilizing back initiating neural system estimation. We have appeared through re-order comes to fruition the adjustment in battery essentialness use without deal off with the speed of data similarity which is accomplished at the cost of inessential impose.

V Jaya Lakshmy, et. al. (2017)

In [5] WSNs is a enlarge branch of recent research. It is a successful research region on account of its wide extent of uses in different areas. It is developing and enhancing in a step by step premise. The WSNs are developed the sensors with limited source whose substitution or recharging is very troublesome. Henceforth, control consumption is thought to be the prevailing variable in the network plan. Routing method chooses the transmission path that us the basic driver of energy consumption. Thus, it is a significant to provide energy effective routing algorithms. Despite the fact that various routing protocol are generated, it is a nothing but hierarchical clustering technique obtained much consideration because of its energy versatility and flexible. Therefore, this paper will provides a basic analysis of couple of hierarchical routing protocols in WSNs.

Abhijeet Das, et. al. (2017)

In [6] the effective power utilizes is the central to consider proven activity of wireless or remote sensor systems. This applies correspondingly to immediate or straight sensor engineers as they make when sensors are sent along direct systems, for example, pipelines. In this work, an imaginative way to deal with oversee criticalness proficient controlling to a double base station or control focus in a straight or direct wireless sensor topology and based on various properties and catastrophes shows up close pipelines; diverse sensor node detects these jolts and promptly reacts to base station presents at both the closures inside certain range. Our instructive demonstrate that a bounce approach spares immense battery control in connection to MTE, MERR and other standard customary frameworks and has close flawless execution.

Notom Ajaykumar, et. al. (2017)

In [7] the frequently demand of QoS (Quality of Service) communication has made wireless communication as an assured features. In this innovation paper, WSNs has been find a route response for acquire significant including observing and control, reconnaissance, medicinal services, movement observation and resistance frameworks. Encouraging QoS demands, energy-efficiency and secure communication has based on the open research zone for the learned community enterprises. The absence of security powers network to experience bargained circumstance as well as makes it energy comprehensive. Then again, giving defers flexible, energy-effective, higher

all through and secure communication makes WSN vigorous and proficient. As of late, the utilization of cryptographic techniques has analysis critical parts to the energy proficient and secure communication. Be that as it may, empowering vigorous arrangement with ideal security technique in conjunction with improved routing techniques is an open research zone. In this study paper, represent that the cryptographic techniques and routing techniques for energy effective and secure communication for WSNs. This innovation, investigates that the usage of a period and determination productive cryptography technique in synchronized with enhanced routing protocol can guarantee secure and energy-proficient communication across WSNs.

Zainal Abedin, et. al. (2017)

In [8] this research author presenting the Wireless Sensor Networks (WSNs) are playing remarkable contribution in real time decision making by actuating the surroundings of environment. As a consequence, the contemporary agriculture is now using WSNs technology for better crop production, such as irrigation scheduling based on moisture level data sensed by the sensors. Since WSNs are deployed in constraints environment, the life time of sensors is very critical for usual operation of networks. In this regard routing protocol is a prime factor for the prolonged life time of sensors. This research focuses the performances analysis of some clustering based routing protocols to select the best routing protocol. Four algorithms are considered, namely Low Energy Adaptive Clustering Hierarchy (LEACH), Threshold Sensitive Energy Efficient sensor Network (TEEN), Stable Election Protocol (SEP) and Energy Aware Multi Hop Multi Path (EAMMH). The Simulation result in MATLAB approach by using the mathematical models of these algorithms in heterogeneous environment. The performance metrics which are considered are stability period, network lifetime, number of dead nodes per round, number of CH (cluster heads) per round, throughput and average residual energy of node. The experimental results illustrate that TEEN provides greater stable region and lifetime than others while SEP ensures more throughput.

Ashish D. Kumbhar, et. al. (2017)

In [9] the author is introducing WSN is a wireless network involves as tiny sensor nodes which are distributed individually and efficient to the sensing physical or environmental condition the mainly focus on the WSN in energy efficiency. Since the nodes near the sink LEACH their energy more rapidly than exchange nodes in the network. The clarification for this is the data requests are traded towards the node near the sink. To triumph over this issue there are different techniques are as of now actualized which means to lessen the over-burden of promoting the situation of destination node to the network. The description for this is the data required to interchange to the source to destination node. To triumph over this difficulty there are different techniques are as of now executed which concentrates on reduce the over-burden of communication of position of sink to network, by facts a chain of significance of nodes which lower different parts on the sensor nodes, for instance, ring nodes and sink node. Recent routing protocols which proposed to enhanced energy effectiveness of network yet at the same time they have a few downsides like hubs move toward becoming hotspots, Parcels misfortunes, Deferrals and energy consumption So to enhance the routing in productive path which will lessen the energy usage by WSN nodes, displayed Ring Coordinating tradition is an innovative, scattered and energy-able convenient sink coordinating protocol which is gotten ready for time sensitive application, which intend to diminish these overheads while shielding pay of adaptable sinks. The Ring Coordinating is dynamic convenient sink tradition which relies upon virtual ring piece which can be easily reconfigurable and furthermore open.

Alagappan Solayappan, et. al. (2017)

In [10] the underwater wireless sensors network pass on message in a range, where there is no possible human mediation. It is problem to alter the battery to manage energy in an acoustic condition. Additionally, thinking about the earth, sun powered energy can't be utilized to revive for batteries. These sensors are required to be caution for an expanded period, taking in trusted that they have obliged energy constraints. One of the burdens in submerged remote sensor structures is the uneven usage of the energy resources. This will as time goes on acknowledge decreasing the lifetime of the sensors in the underwater networks. Exactly when stood out from standard WSNs Underwater Wireless Sensor Networks (UWSN) have a harsher including, which could be changed over into high energy necessities, low trade speed, diminished throughput, and increase delay. In multi-ricochet correspondence, the division between the snare node and the standard node is more composes; which prompts more utilization of energy. Then again, since the separation is longer, it happens as intended into signal narrowing, finishing into rehash control disaster. The speed of the sound in Profound Sea ought to be considered as the profundity of the sea increments. A run of the mill control unearthly thickness happens when the consolidated attenuation and commotion are joined. Among the layers of acoustic sensor engineer physical UWSN convention is portrayed in a way that the energy utilizes is adjusted. While bunches are being sent, the energy use must be less or adjusted, else energy openings are made. In such cases, the energy utilization, lifetime, and throughput are extended. In this paper, we are outlining a large portion of the present energy based directing protocols. They gave data doesn’t be support to analysis and scheme

protocols for wireless underwater sensor networks by minimizing energy consumption.

Junaid Shabbir Abbasi, et. al. (2017)

In [11] the author introduces Modeling of UWSNs (Underwater Wireless Sensor Networks) with a destination of larger lifetime of network and throughput with lower energy utilization is a fully problematic work because of limited battery power and simple underwater techniques. The BEER (Balanced Energy Efficient Rectangular routing protocol) encloses the network section with the versatile of sink nodes in their transmission range using implicit transmission. Sink development parameter the throughput and modify the energy utilization. Reproduction comes about confirm that our plan performs exceptional regarding system lifetime, steadiness period and throughput with least energy utilization.

Deepak M. Birajdar, et. al. (2017)

In [12] WSNs comprises an immense number of acceptable sensor nodes. These nodes are carrying of sensing and perceive nature or physical condition like weight, temperature, motion and sound etc. and represent with different nodes. Sensor nodes in WSNs have restricted power and energy basic thus it winds up analytic to use these benefits. In WSN, energy utilization is the important problem to beat this problem there are various routes of action displayed, it contains level, hierarchical and region based routing. The fundamental hierarchical routing protocol for WSNs is Low Energy Adaptive clustering Hierarchy (LEACH). LEACH works in two unmistakable stages viz. set-up and predictable state arrange. LEACH every so often do the transformations among bundle head nodes with the end goal that every node obtained a opportunity to twist up assemble head and routes energy usage between the nodes in the network which decreases the power utilize, expanding the lifetime of the network. In this research detail working of LEACH is examine using Omnet++ simulator.

Soumitra Das, et. al. (2017)

In [13] the author represent that, currently WSNs has acquired a huge of recognition because of its wide-range section of applications. Sensor nodes in WSNs are related to each other by networks, mainly energy by battery source. These sensor nodes have lower determination of energy and computational ability. Generally, sensor nodes are transmitted in remote area where exchange of their batteries once depleted turns out to be greatly troublesome and unwieldy. Battery control is pivotal part of the network. To augment the life expectancy of sensor nodes we represent a transmission calculation based model. In this model, energy is scattered among all the sensor nodes and network execution is enhanced by picking the pack head and clustering in light of 3 basic factors: a. remaining energy, b. expel from the sink and c. trust of the mode. The trust of the node recognizes harmful nodes in the territory. To also expand the network lifetime, the proposed show executes a multi-bounce coordinating segment for information spread from source to the sink. To exhibit the progressing reasonability of the proposed appear, we re-authorized it using MATLAB and differentiated and Outline and Usage of Another Energy Efficient Clustering Algorithm utilizing Genetic Algorithm for Wireless Sensor Networks (DINEECAGA). The count was assessing in the size of 20 to 60 sensor nodes. Research result represent that the innovated shown is clearly better regarding boosting the network lifetime than the DINEECAGA.

Wenbo Zhang, et. al. (2017)

In [14] a divergent ring space correspondence topology with parallel region in each ring is represent to in this examination paper is an attempt to tackle the energy adjust issue in genuine IPv6 routing protocol for bring down energy and misfortune systems. Another clustering calculation and event driven group head upset framework are in like manner proposed in perspective of this topology. The clustering data statement message and clustering contention message were managed by RFC and one of a kind RPL message structure. An energy-effective heterogeneous ring clustering (E2HRC) routing protocol for remote sensor systems is then proposed and the comparing routing algorithm and helps techniques are set up. Related messages are poor down in detail. Re-enactment results exhibit that in relationship against the principal RPL, the E2HRC routing protocol more effectively modifies remote sensor organize energy utilization, thusly decreasing both node energy utilization and the amount of control messages.

Taweesak Samanchuen, et. al. (2017)

In [15] the Wireless sensor networks (WSNs) are introduced by author for designed to auditing environment that is hard to access. The energy of every node has its limit and can't be changed. Whole segments of WSNs must be energy effective components, not just H/W components likewise S/W. Energy effective routing protocol can drag out the systems lifetime. Responsive WSNs is tended to in this work. A protocol using static clustering strategy with gather head decision in perspective of most outrageous outstanding energy is proposed. Re-order is performed to demonstrate the execution of the proposed protocol. It is exhibited that the proposed protocol can draw out the system lifetime better than that of the protocol.

Mehrdad Manouchehri, et. al. (2017)

In [16] the author presenting the WSNs are involved a gathering of nodes, which are arbitrarily appropriated in a situation. Since the energy utilizations of nodes are confined in these systems, data should be accumulated and sent in a perfect world and in an energy-proficient path. The accessible routing protocols are utilized to forward data. The principle work of this protocol is to diminish energy utilization and addition organize lifetime in routing. Energy-effective routing protocols are analyzed for such systems in this paper. These protocols are isolated into three gatherings, in view of information, network structure and unwavering quality. As to driven protocols, on-request and transaction based protocols are talked about. In view of the network structure, various levelled and area based protocol are represented. In the dependability based gathering, the nature of management and multi-path routing protocols are introduced. Notwithstanding researching the protocols of integration and problems in energy-efficient routing, the obtained attributes are contrasted all together with present the best protocol in each gathering.

III. COMPARATIVE STUDY

Paper Title	Techniques	Advantages	Disadvantages
SEESH: Sleep-awake energy efficient super heterogeneous routing protocol for Wireless Sensor Networks	Energy efficiency, Routing protocols, Clustering algorithms, Data communication, Wireless sensor networks, Stability criteria, routing protocols, telecommunication power management, wireless sensor networks	Results are good; data transfer is working without intrusion.	Battery life is minimum,
A comprehensive survey of secure and energy efficient routing protocols and data collection approaches in wireless sensor networks	Wireless sensor networks, routing protocols, base Stations, remaining energy, clustering, are routing.	sensor node covers large areas, WSNs increases the scalability and efficiency of the routing protocol	Communication energy use high level.
Energy Efficient Wireless Sensor Network Using Neural Network Based Smart Sampling and Reliable Routing Protocol	Wireless sensor networks, Smart sampling, Neural networks, Energy efficient, Reliable routing.	Good data transmission Performance	More battery uses, minimum rounds.
A Structural Analysis of few Energy Efficient Hierarchical routing protocols in Wireless Sensor Networks	Wireless Sensor Networks (WSNs), Routing, Energy efficient routing algorithms, hierarchical clustering	MIEEPB, Fast working	Battery uses are increases at the communication time.

IV. CONCLUSION AND FUTURE WORK

In this research paper represents that, Efficient Energy Routing protocol is the fundamental demand for WSNs, because after some round sensor nodes are dead. The Number of rounds based upon the power of individual sensor which is calculated in node. The value of these rounds is different for every routing protocol. So, now we have a required to design energy efficient routing protocol which helps to control sensor alive for the long round. In this research paper, we have studies many base papers which mainly focus on the Energy Efficient Routing Protocol for WSNs. We have differentiates multiple numbers of routing protocols in several features. All these reviews paper concealed Energy Efficient Routing Protocols for WSNs but still improvement is required. In feature research work are based on the multiple numbers of issues in existing research, which are not covered in existing protocols.

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