Energy Efficient Techniques of WSN : A Review

S.Nanthini[1*], Dr.S.Nithya kalyani[2], Dr.S.Sudhakar[3]
[1]Assistant Professor,Dept. of Computer Science and Engineering,Sri Ramakrishna College of Engineering, Perambalur
[2]Associate Professor, Dept. of Information Technology,KSR College of Engineering, Tiruchengode
[3]Professor, Dept. of Computer Science and Engineering, EASA College of Engineering, Coimbatore

Abstract— The major drawback of any sensor node in WSN, if limited resource constraints. It is very essential to manage the limited energy supply of battery present in the sensor node. A sensor node is smaller in size and has sensing, processing, and computing capabilities. All these operations consume a reasonable amount of energy. Each sensor node is energy and resource constrained node. Since the batteries enabled in sensors are not changeable, losing the energy is slowly make the sensor node to fail. The network lifetime depends on the resources used in WSNs. Energy optimization mechanisms are used to enhance the network lifetime.

Keywords: Sensor Node, limited energy supply, Smaller Size, Network Lifetime, Energy Optimization mechanisms

I. INTRODUCTION

Wireless sensor network (WSN) may be a multi-hop wireless networks transmits with it an enormous of trivial size, low value, and low power sensor nodes that are capable of sensing, computing, and communication. WSN take advantage of preparation rapidly and powerful survivability without fixed network support, however also with features of dynamic topology structure and energy resources are restricted so on. The application of WSN is a revolution of perceived and collection of information. WSNs often outlined as a network of devices which communicates the information gathered from a monitored field through wireless links. The data forwarded through multiple nodes, and with an entranceway, the information connected to different networks like wireless LAN. A WNS consists of base stations and numbers of nodes (wireless sensors). These networks are adapted to monitor physical or environmental conditions like sound, pressure, temperature, and co-operatively pass data through the network to a primary location. WSN are extremely distributed networks of tiny, light-weight wireless nodes deployed in large numbers to observe the surroundings and used to measure the physical parameters. Sensor node consists of the following subsystems.

Sensor subsystem:-Responsible for sensing the environment.

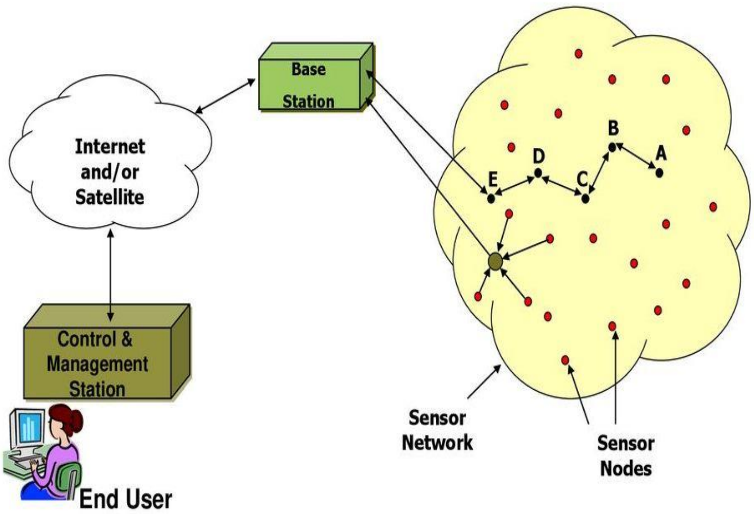

Figure 1.Wireless Sensor Network Architecture

Handling subsystem:-Responsible for performance of limited computation on the identified data.

Communication subsystem: - Responsible for message exchange with neighboring sensing nodes.

The WNS is fault tolerant because more nodes are subjected to sense the same. WNS provides accurate sensing of events in the environment since the nodes cooperate and collaborate on their data. Data dissemination and Data gathering are the two primary operations of WNS. The data dissemination is the method of propagating data/queries throughout the network. Data gathering is that the method of assembling ascertains knowledge from the individual sensor nodes to a sink node. An essential feature of Sensor networks is data event fusion/aggregation, whereby the sensor nodes aggregate the local information into meaningful information before relaying. The fusion reduces bandwidth consumption, delay, power consumption

II.LIMITATIONS OF WSNS

- WSN possess little storage capacity
- Possesses quiet processing power-8MHz
- Communication range of WSN is very short, and they may consume much power
- Requires minimal energy – constrains protocols
- WSN Have batteries with a finite lifetime
- Passive devices of WSN provide little energy.

III.CHALLENGES OF WIRELESS NETWORK

A. *Node deployment*

Due to node deployment in WSNs, this affects the performance of the routing protocol. The sending might be deterministic or randomized. In deterministic sending, the sensors physically set, and information directed through foreordained ways. Be that as it may, in irregular hub sending, the sensor hubs are dissipated arbitrarily, making a foundation in a specially appointed way.

B. *Energy consumption*

Sensor nodes limited their supply of energy performing computations and transmitting information in a wireless surrounding. As such, energy-conserving forms of communication and computation are essential. Sensor hub lifetime demonstrates a firm reliance on the battery lifetime.

C. Information Reporting Model

Information detecting and detailing in WSNs is reliant on the application and the time basically of the information revealing.

D. Adaptation to Internal Failure:

Some sensor hubs may come up short because of the absence of intensity, physical harm, or ecological impedance. The disappointments of sensor hubs ought not to influence the general assignment of the sensor organize.

E.Quality of Service

In some applications, data delivered within a specified period from the moment it sensed; otherwise, the data is useless. Therefore bounded latency for data delivery is another condition for time-constrained applications.

IV.GENERAL APPROACHES TO ENERGY SAVING

A. *Duty cycling*

Duty cycling achieved through two different and complementary approaches: Topology control, Power Management. The first is topology control, which lessens the number of hubs engaged with sending and directing parcels produced by different hubs without decreasing system network and inclusion. The second technique is to control the board, which presents MAC conventions and a wake-up planning plan in which amid inactive express, a hub rests in more openings and still keeps up hub network.

B. *Data-driven*

There are two ways by which the data-driven approach affects energy consumption. First, it sorts out unneeded samples, which results in useless energy consumption and stops them from being transmitted to the sink. Secondly, it minimizes the power consumption of the sensing subsystem by keeping the accuracy of the sensor at a reasonable level

C. *Mobility*

Mobility of sensor nodes achieved in different ways. Initial, a mobilizer can be appended to a sensor which changes its area; be that as it may, this development restricted to a couple of hubs which are not repressed by vitality. Another strategy is to put sensors on versatile components, for example, creatures and vehicles.

V.LITERATURE REVIEW

Yang Liu et al. (2018) considers joint precoder design to optimize throughput via developing centralized and decentralized algorithms, power consumption and energy efficiency (EE) in the context of multi-antenna WSNs with coherent multiple access channels. They also propose a novel decentralized solution and analyses its convergence. Abdelbari Ben Yagouta et al. (2017) focused on the impact of sink mobility on energy consumption and QoS metrics in WSN with hierarchical routing protocols under various scenarios. Sink mobility improves energy consumption, throughput, reliability, and packets latency, compared to a sink located outside the field. Jie Huang (2017) expounds the vitality utilization model of the remote sensor organize, the topological system structure of the multi-group head based bunching steering calculation can accomplish odd parity on vitality utilization, which viably expands the administration life and improves the strength of the remote sensor arrange. S.Jothi et al. (2016) proposed cluster-based scheduling in WNSs. An energy, efficient wake-up scheduling algorithm supports high data rate transmission and reduces energy consumption. Probability-based Prediction and Sleep Scheduling protocol is used to reduce total energy consumption. Shourya Khare et al. (2016) aims at increasing the lifetime of sensor nodes by adopting an efficient scheduling algorithm named Shortest Time First (STF). Rendering to STF, all the cluster heads are organized to send their accumulated data based on period is taken for their signal to range the base station, which would help in decreasing the waiting time of other cluster heads in a specific round and eventually preserve energy. Swati Patil et al. (2016) target need based bundle booking strategy like FCFS, SJF, RR (Round Robin),Preemptive, non-preemptive packet scheduling, and so on anyway this booking calculations have a few disadvantages like top of the line to-end delay, a great deal of Energy utilization directing overheads. To overcome these issues, a new packet scheduling algorithm is projected that achieves reliability; less energy consumption avoids inconsistent delay of packets. The proposed algorithm is Dynamic multilevel Priority (DMP) scheduling changes the idea of Preemption which is assigned and dynamically change the priority of the lower priority packets because of existing high priority packet rush at an equivalent queue and introduce the idea of the multilevel queues. For this algorithm, three-level Queues for process Real-time and Non-Real time packets. In the primary queue method highest priority real-time packets. In second queue Non-Real time highest priority types of packets are processed, and in the third queue non-real time local information packets with less priority are processed.

Mohammed Abo-Zahhad, et al. (2015) proposed an energy consumption model that is employed to optimize transmitted power to attain minimum energy consumption. Chu-Fu Wang et al. (2014), tend to propose a moving strategy called energy-aware sink relocation (EASR) for mobile sinks in WSNs. This EASR technique can extend the network lifetime of the WSN.M. Joseph Auxilius Jude et al. (2014) projected another queue oriented algorithm as Adaptive Duty Cycle Scheduling for embedded sensor systems. This method furnishes productive reservation with decreased postponement and vitality utilization. At the point when contrast and SMAC algorithm, the Adaptive Duty Cycle Scheduling algorithm reduces the basic information misfortune. SMAC comprise of a fixed dynamic time and fixed rest time length. Sooner or later in rest, time sensor hub not detects and sends or gets data's. In any case, in the proposed calculation, the rest time and the dynamic time is differed powerfully dependent on the detected information. For the time of rest time, if any basic information is identified, the sensor hub goes into a functioning mode so no basic information misfortune is happening and decreases the deferral in getting to high need information.Yaknapriya (2014) suggested a substitution line principally based planning method alluded to as versatile Duty Cycle planning for embedded sensor systems. This algorithm provides cost-effective development with condensed interval and energy utilization. Singaram et al. (2014) targeted the issues of energy conservation and full sensing coverage in giant WSNs wherever nodes are at random deployed is addressed. The ERGS algorithm has been introduced based on a wake-up scheduling by permitting one to increase the life of the WSN. The ERGS algorithm depends on the new plan of exploiting the remaining energy in creating a call on that node needs to enter a sleep state. The original main feature of the ERGS algorithm consists in applying an equity principle by reconciliation the remaining energy of nodes. It has contributed to increasing the WSN lifetime. The second main feature consists in avoiding negotiation phases, as a decision to enter sleep state uses a computed priority supported one-hop neighborhood information. Atero et al. (2011) as ranked adaptive and Trustworthy a clustering algorithm that forms inter-cluster and intra-cluster ordered trees that are enhanced to protect lots of energy. Hierarchical adaptive and Reliable Routing Protocol provides efficient link fault tolerance and additionally supports replacement cluster head election formulation, and its associated knowledge gathering protocol (s-HARP) proposed. This protocol optimizes and balances the energy consumption within the network. The performance analysis of HARP and s-HARP considerably reduce the energy consumption and prolong the useful lifetime of the network. Kyung Tae kim et al. (2010) proposed a unique tree-based clustering (TBC) approach for energy efficient WSNs for effectively reduces energy consumption among the nodes, and extends the network lifespan.

Table 1: Comparison of energy efficient Techniques

Article	Authors	Findings
Dynamic energy consumption analysis and test of the node in WSNs	Yu et al. 2017	This paper summarizes the test method of node energy consumption in WSN
Energy Efficient Sleep-Scheduling for Cluster-Based Aggregation in WSN	Jothi et al. 2016	Energy efficient wake-up scheduling proposed to reduce the energy consumption which supports high data rate transmission
STF	Shourya et al. 2016	To increase the lifetime of sensor nodes using the Shortest Time First.STF and Low Energy Adaptive Clustering Hierarchy Centralised Sleeping (LEACH CS) increases energy efficiency.
Linear Precoding to Optimize Throughput, Power Consumption and Energy Efficiency in MIMO WSNs	Yang et al. 2018	Centralized and Decentralized Algorithms Developed to Maximize Throughput. To optimize throughput, power consumption dual-decomposition based decentralized algorithm and block successive upper-bound method developed
Effect of Sink Mobility on Quality of Service Performance and Energy Consumption in WSN with Cluster-Based Routing Protocols	Abdelbari et al. 2017	Cluster-based routing protocols can be exposed conservation of energy by reducing the number of transmitted nodes
Research on Balanced Vitality Consumption of WNS Nodes Based on Clustering Algorithm	Jie Huang et al. 2017	A multi-cluster-head based clustering routing algorithm developed to achieve better balance the energy consumption of WNS nodes and extend the life of the network

VI.CONCLUSION

The resource-constrained of sensors arises the problem of energy. In this paper, different vitality proficient strategies explored and investigated as far as specific parameters that are endeavoring the vitality effectiveness challenges in WSNs.

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