

An Energy Aware Routing to Optimize Route Selection in Cluster-Based Wireless Sensor-IoT Network (EACW)

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Abstract- A Wireless Sensor Network (WSN) is an autonomous, self-organizing, and self-configuring network with the capability of speedy deployment anywhere. Internet of Things (IoT) nodes use cloud storage to collect information from sensors and transfer it to other IoT nodes or networks via cloud services. Energy-efficient communication is likely one of the main conversation factors in WSN, so efficient routing is critical to make use of full power consumption and enhance the network performance. This research proposes an Energy Aware Cluster-based Wireless Sensor (EACW) routing protocol that optimises route selection by clustering of nodes in a Wireless Sensor IoT network.

Keywords:- LEACH, WSN-IoT, Energy, Routing, EACW.

I. INTRODUCTION

A variety of different technologies are combined to form the Internet of Things (IoT). IoT is mostly composed of five components. The core component of the Internet of Things is the wireless sensor network, which enables anything (an object) with a sensor and actuator thanks to a microcontroller called a sensor node. Through the sensor and the signal actuator meant to move the item, the sensor node creates data. The data produced by the sensor node must be sent to the gateway node, which is the second component of the IoT. The gateway node, sometimes referred to as the base station, sink, or network device, is really connected to the internet and has an IP address. The gateway node collects and aggregates all the data generated by the wireless sensor network before sending it to the IoT's cloud computing component. The cloud, which uses an analytical model to store and analyze data, is the Internet of Things' fourth component. Following processing, the user receives the information via the interface. The fifth component of the Internet of Things is the interface. An interface might be a message, a web application that can be accessed using a web browser, or a mobile app.

II. LITERATURE SURVEY

Jaya Mishra, Jaspal Bagga et.al.[1] A cluster-based routing protocol for IoT enabled WSN networks has been presented in the article titled "Performance

Evaluation of Cluster-based Routing Protocol utilized in Wireless Internet-of-Things Sensor Networks" The cluster-based routing protocol is also called the energy-efficient protocol because it can collect information in the cluster head and send as little information as possible to the gateway node.

Muhammad Nadeem Akhtar et.al [2]. "Cluster based Routing Protocols for Wireless Sensor Networks: An Overview" This study focuses on clustered-based routing protocols, which are mostly used in WSNs to reduce energy consumption and are a subtype of "network structure" scheme. On the basis of various key performance indicators, including energy efficiency, (ii) algorithm complexity, (iii) scalability, (iv) data delivery latency, and (v) clustering technique, this study evaluates and summarises popular cluster-based energy-efficient routing protocols.

Asha Jerlin Manue et.al.[3] The primary focus of this paper, "Optimization of Routing- Based Clustering Approaches in Wireless Sensor Networks: Review and Open Research Issues," is multi-hop routing in a clustering context. Our study was divided into three method types in accordance with cluster-related metrics and properties: Specifically, parameter-based, optimization-based, and methodology-based approaches. There are numerous approaches within the overall category, so the concept, parameters, benefits, and drawbacks are explored.

Masood Ahmad *et.al.* [4] “Optimal Clustering in Wireless Sensor Networks for the web of Things supported Memetic Algorithm: memeWSN” In this chapter, they suggest using local exploration strategies in conjunction with WSN clustering assisted by the memetic algorithm (MemA) to reduce the likelihood of early convergence. MemA is frequently used in WSN-IoT to dynamically balance the load among clusters and find the best clusters. This study aims to find a cluster head set (CH-set) as soon as feasible once a requirement arises. The WMNs with high weight values are chosen instead of the newest residents in the next generation.

Yamin Han *et.al.* [5] “Energy-Balanced Cluster-Routing Protocol supported Particle Swarm Optimization with Five Mutation Operators for Wireless Sensor Networks” The goal of each CH is to designate one sensor node in each cluster as the cluster head. In this title technique, sensor nodes are organised into a number of clusters (CH). It gathers information from opposing sensor nodes in its cluster, then delivers that information to the sink. But because sensor nodes aren't usually spread out in the same way across the sensing zone, there may not be an even distribution of sensor nodes within clusters. This means that CHs will use different amounts of energy.

Raúl Aquino-Santos *et.al.* [6] “Performance analysis of routing strategies for wireless sensor networks” The three most commonly used algorithms by wireless ad-hoc and sensor networks are source, shortest path, hierarchical, and geographical routing. This title analyses their presentation. Source routing was chosen because it doesn't require expensive topology upkeep; shortest path routing was picked for its straightforward discovery routing method; and hierarchical and geographical routing were chosen because they make use of position data from the Global Positioning System (GPS). Many modern applications, notably those in the fields of health, defence, agriculture, robotics, and environmental and structural monitoring, require accurate knowledge of physical location information. The shortest path routing method was also chosen since it is used in the ZigBee standard as well as numerous data-centric wireless sensor network techniques, including Direct Diffusion, Rumor Routing, Gradient-Based Routing, and others.

Shio Kumar Singh *et. al.* [7] “A Survey of Energy-Efficient Hierarchical Cluster-Based Routing in Wireless Sensor Networks” In this article, the focus is mostly on a study of the energy-efficient hierarchical cluster-based routings that are currently available for wireless sensor networks. Recent developments in communications and processing have made it possible for wireless sensor networks to contain inexpensive, low-power, compact, and multifunctional sensor nodes. One of the major problems with wireless sensor networks is the sensor nodes' built-in restricted battery life since radio transmission and reception need a lot of energy. The design of the algorithm must take battery power into account to increase the longevity of the network's nodes. In order to maximise network performance overall, it is better to spread the energy wasted over the wireless sensor network in addition to increasing the lifespan of sensor nodes. In recent years, a lot of research has been done on a variety of topics, including wireless sensor network coverage issues, network setups, routing methods, and low power protocols.

Huanan Zhang [8] “Cluster-based routing protocols for wireless sensor networks” This title examines wireless sensor network cluster-based routing techniques. Three essential methods in cluster-based routing protocols are cluster head selection, cluster creation, and data broadcast. Recent ambassador cluster-based routing protocols are introduced, and their characteristics and application domains are compared as seen from the three approaches. The longer-term research questions in this field are finally authorised.

Sultan Alkhliwi [9] “Energy Efficient Cluster based Routing Protocol with Secure IDS for IoT Assisted Heterogeneous WSN” This chapter introduces EECRP-SID, a secure intrusion detection system with an energy-efficient cluster-based routing protocol for HWSN. The three primary stages of the upcoming EECRP-SID approach are cluster formation, optimum route selection, and interruption detection. The selection of the cluster head (CH) is initially done using the sort II fuzzy logic-based clustering (T2FC) method with three input parameters. These characteristics are the node density, the DTBS, and the residual energy state (REL) (NDEN). In addition to CH choice, the salp swarm optimization (SSO) method is used to determine the best inter-cluster data transmission channels,

resulting in an energy-efficient HWSN. Finally, an effective intrusion detection system (IDS) employing long STM (LSTM) is run on the CHs to identify the presence of intruders within the network in order to achieve security in cluster-based WSN.

Walid Osamy *et. al.* [10] “Deterministic clustering based compressive sensing scheme for fog-supported heterogeneous wireless sensor networks” In this chapter, we address the information gathering challenge for fog-supported heterogeneous WSNs by introducing an effective deterministic clustering-based CS scheme (DCCS). DCCS leverages the fog computing idea, decreases overall overhead and computational costs necessary to self-organize sensor networks by using a straightforward method, and then utilises CS at each sensor node to minimise overall energy consumption and extend the lifespan of the IoT network. Additionally, the suggested approach incorporates an effective CS reconstruction technique termed Random Selection Matching Pursuit (RSMP) to support the bottom station (BS) side recovery process with a full CS scenario. In the forward stage of the RSMP, there is a random selection process that lets you pick additional columns as an estimated answer each time.

Maman Abdurohman *et. al.* [11] “A Modified E-LEACH Routing Protocol for Improving the Lifetime of a Wireless Sensor Network” In order to extend the lifespan of a wireless sensor network, this article suggests a modified end-to-end secure low energy adaptive clustering hierarchy (ME-LEACH) method (WSN). Every action in a WSN must effectively use energy since energy restrictions are a key constraint. A number of protocols are offered to modify how a WSN transmits and receives data. A hierarchical routing protocol technique called the end-to-end secure low energy adaptive clustering hierarchy (E-LEACH) protocol has been developed to solve high-energy dissipation issues. The sparsity-aware energy efficient clustering (SEEC) protocol and an energy efficient clustering-based routing protocol that uses an improved cluster formation technique alongside the symbolic logic (EERRCUF) method are additional approaches that investigate the existence of the most powerful nodes on each cluster as cluster heads (CHs). However, the E-LEACH system uses a lot of energy because each CH transmits

data to the bottom station. While EERRCUF expends a lot of energy figuring out the super cluster head, SEEC uses a lot of energy to identify the most potent sensor nodes (SCH).

Chaitra H.V *et. al.* [12] “Secure and Efficient Cluster Based Routing Model for Wireless Sensor Network” In this paper, a multi-objective cluster selection method employing an improved Imperialist Competitive Algorithm is presented. Furthermore, the current model is built using asymmetric cryptography, such as RSA, Diffie-Hellman, and others, to provide secure communication.

Huarui Wu *et al.* [13] "Energy Efficient Chain Based Routing Protocol for Orchard Wireless Sensor Network," In this paper, we examine how wireless sensor network nodes have a finite amount of energy. It has become a hot topic to discuss how to get the most out of the little energy available for efficient data transfer. We propose an improved chain-based clustering hierarchical routing (ICCHR) algorithm based on the LEACH algorithm, which takes into account the characteristics of orchard planting in rows and the shade caused by sparse random features, to increase the energy efficiency of the orchard wireless sensor network and lengthen its lifetime. The ICCHR approach is also simulated in MATLAB using the E-LEACH, PEGASIS-E, LEACH-1R, PEGASIS, and P-LEACH algorithms to study cluster formation, cluster head election, chain creation, and data transmission.

III. CONCLUSIONS

The nodes in a Wireless Sensor Network (WSN) are able to store information and also transfer data to other sensor nodes for data delivery outside the network area or city with the help of IoT nodes. The IoT nodes are not only for switching off or on the other IoT-enabled devices; we can also use them for routing data or transferring information from one network to other networks. The cluster-based routing approach utilises the energy and performance of the clusters better than the traditional routing for sending the data in the groups. All nodes do not participate in routing, and the role of CHs and CMs reduces flooding in the network. To improve route efficiency in WSN-IoT, energy-efficient utilization is required.

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