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Performance Analysis with LEACH and PEGASIS Regarding Network Optimization

Ahmed Mateen[1*], Qing Sheng Zhu[1], Maida Sehar[2]

[1]Department of Computer Science, Chongqing University, China.

[2]Department of Computer Science, University of Agriculture Faisalabad, Pakistan

*Corresponding Author

Abstract: Wireless sensor networks are made of small battery powered devices which have limited energy resources. After deployment, small sensor nodes are not accessible to the user which make replacement of energy source difficult. Energy efficiency is an important issue which has to be addressed to enhance life span of the network. Routing protocols strongly effect efficiency of any sensor network. Routing becomes challenging in wireless sensor networks due to their inherent characters which differentiate them from other wireless networks. There are variable routing protocols in WSN depending on the application and network architecture. The introduction of both wired and wireless sensor network can be cost, productivity, constant quality and safety contrast and unique components. The bandwidth and management of these systems are the same, but the implementation of the project does not depend on several issues. The information is sent in these systems with a specific delay and throughput. In this paper I have considered two guidance conventions LEACH and PEGASIS in a wired and wireless sensor network system with various package sizes and data transfer capabilities in NS 2 Simulator. The aim of this paper is to evaluate by analyzing these protocols in term of total energy consumed, overheads, latency and sensors lifetime which provides a comparison of LEACH and PEGASIS with simulation results.

Keywords: *Wired network; wireless sensor network; Delay; Throughput*

I. Introduction

The computer network is a collection of interoperable free computers that allow communication between varieties of customers. PC networks are being used in everyday life. Computer networks are the accumulation of personal computers and device gadgets that are interconnected by wired or remote connections. These systems are mainly used to send communication information, and between different clients to share printers, scanners, programming and other assets. Some of these PC systems are used for e-mail, video conferencing, ticket booking. PC networks can be grouped according to various qualities.

A. Wired network

Guidance is to find the way from the source to the target way to convey the system of information packets. The delivery of the package from the source to the target is the work of the cable system.

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Wired systems boot effectively complete bundled changes, with the help of a wired system, under the idea of switching and legitimate tendencies should be effortless [1].

B. Wireless networks

Remote Sensor Organization (WSN) is a remote arrangement that allows the body to tolerate the size of the free technology to observe the body and the inclusive environment, similar to the high temperature, hustle, trembling, great, development or toxin, The Remote Sensor System (WSN) stands at a large number of reasonable, low utilization and academic sensor hubs as well as individual or additional reduction or base station (BS) [2].

II.   Literature review

In 2000, authors [3] proposed that the remote transmission of the micro sensor frame will be assigned to this function relatively observe the various conditions of the two Common and military applications. In this article, let's take a look Communication practices can have a huge impact the general activity scattering of these systems. In view of our discovery, common practice Coordination of communication, the lowest frequency of transmission, multi-hop Steering and static bunch may not be ideal Sensor system, we propose LEACH (low energy adaptive Packet hierarchical structure), a protocol based on aggregation Using a random pivot of the neighbor beam base station (Leader) to fairly communicate the vitality stack Sensors in the system.

In 2003, researchers [4] described that the further development of remote sensor systems has led to many new practices that are particularly applicable to sensor systems Vigorous mindfulness is a fundamental thought.

In 2007, an author [5] evaluate that some hubs have often destroyed the apparently unreasonable and achievable perceptual range for a long time after fatigue has required vitality assets. The system's perceived perceptual range has provided alternative security conventions for LEACH and virtual work steering conventions. These proposed conventions can greatly enhance the introduction of detection communications. The results of the entertainment show that the range ratio is different from the difficulty of covering the safety agreement than the measurement is slow.

In 2009, a group of authors [6] proposed the variety of equilibrium chains based on a satellite star topology with PEGASIS and enhanced PEGASIS, we propose a viability productivity scheme called CHIRON. CHIRON's basic idea is to isolate the detection site into most of the cells. It is conceivable to create a variety of shorter chains in this way to collect information exchange delays and redundant ways to effectively save the hub vitality and increase the life.

Another group of researchers [7] proposed All sensor hubs in the remote sensor system work through their own inserted batteries if the hub is running out Of the battery, the sensor cannot be scheduled to work regularly. In this case, we should use the guiding practice this can be proficient in the center of the vitality. There are many vigor conventions that are effectively guided in the sensor system However, LEACH and PEGASIS are the most notable conventions. We presented another half

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of LEACH and PEGASIS meetings LEACH's packet system and PEGASIS's fixed instrument, making the sensor life Organization is longer than the different practice.

In 2017 authors [8] define the reliable use of aggregated data from inaccessible locations, remote sensors Arrange for a weird test of the information guide to more vigorously expand the correspondence skill level.

A group of researchers [9] proposed the high-speed remote sensor networks, communication between the transmitter and the collector should be possible through the node. The node detects the data and transfers the data from one point to another Target (or base station).

Another group of researchers [10] proposed that the use of LEACH and PEGASIS in remote sensing sensors at various levels of habit, which are viable and well controlled and effective. The bunching heads sway their errands in time and can also communicate on the base station.

In 2015 researchers [11] presented the remote sensor arrangement includes a single sensor or a hub that organizes specific tasks that use telemetric to complete their collaboration. The transmission range of the sensor hub is limited by capacity constraints preparation, vitality assets, and computational productivity is also limited. As a result of the proposed limitations, the system life is a fundamental part of any remote sensor system.

Another group of authors [12] defined that the remote sensor network consists of a restricted hub Control source and low data transfer. Ideal course corresponding information more reflects the vitality of the system. The PEGASIS convention depends on a variety of horizontal arrangement designs proposed a wireless sensor network.

In 2014 researchers [13] presented the sensor hub has a limited measurement of the battery in the sensor tissue. In this way, you must have the most extreme life cycle of the system through a strong command of vitality. In order to achieve the most extreme life cycle Sensor hub, it is important to outline and use proficient Bunching Drainage is an excellent steering convention Given the bunch, but it has some problems like short Taking into account the vitality of waste, arrange life and so on use. Has made some changes to overcome these questions are in LEACH.

In 2014, authors [14] described that the use of sensor test system for entertainment, such as the use of indicators such as pointer category, system life, data collection, scalability and LEACH and PEGASIS specific methods to complete the two agreed checks. The restriction information preparation occurs at a distribution center called a cluster head and sends information through the information collected in the LEACH to the center of the information.

In 2013, researchers [15] presented that the remote sensor network (WSN) with dynamic applications provides scientists with great consideration. Consistent Observe the basic situation of the analyst using the wireless sensor network in the great stage.

Researchers [16] concluded that cluster-based routing protocol LEACH collect data from its neighbor node and before transferring it to sink node it completes the data aggregation process. During this process all nodes in a network consumed equal energy and by using some algorithm network life span can be extended.

In 2012 a group of authors [17] explained that in WSN, base station is a static node while other nodes are mobile/dynamic nodes and if transmition is required from one domain to other group, a

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gateway node works as a rely node for communication which also reduces the network resource utilization.

A team of researchers [18] proposed WSN (CBR-Mobile) protocol for mobile nodes which reduced the packet loss during the mobility using MAC address in an efficient manner so the vacant time slot where no data was sent would be reassigned to other node in a cluster-based network with adaptive approach of the protocol in a hybrid manner.

III. Comparative Analysis

Table 1: Comparative Analysis of LEACH and PEGASIS [18]

Sr. No.	Parameter	LEACH	PEGASIS
1	Classification	Cluster based	Chain Based
2	Data Transmitter	Cluster based	Round Leader
3	Clustering Method	Distributed	Hybrid
4	Mobility	Fixed BS	Fixed BS
5	Number of clusters	Multiple	Single
6	Data aggregation	Yes	No
7	Query based	No	No
8	Choice of cluster	Based on the probabilistic approach	Based onthe distance from thebase station
9	Number of groups	Not Guaranteed	Guaranteed
10	Scalability	Medium	Poor
11	Efficiency	Poor	High

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12	Delay	Very small	Very Large
13	Deployment of nodes	Random	Random
14	Load balancing	Low	Medium
15	Complexity	Low	High
16	Service	No	No

IV. Experiment result

In LEACH protocol, the communication overhead route energy increases as we add more nodes in the network. In LEACH protocol significant overhead occurs which has an effect on the security, energy consumption, the quality of service and communication stability in large networks.
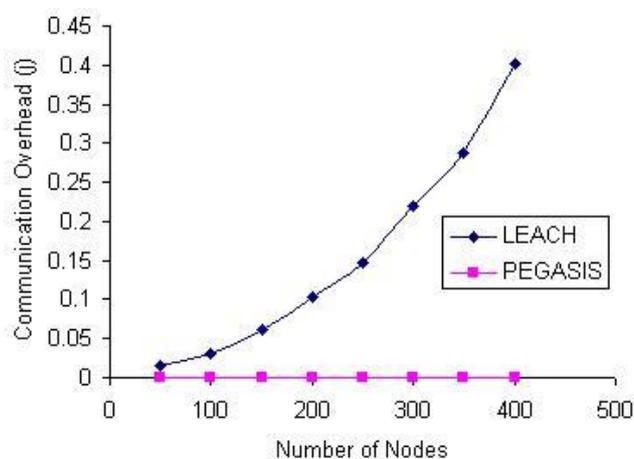
Figure 1. Number of Nodes and Communication Overhead for LEACH and PEGASIS

While in case of PEGASIS protocol, the overheads are very small and almost negligible, it does not affect other network characteristics. So, for dynamic cluster formation PEGASIS outperforms the LEACH protocol regarding communication overhead [16].

Figure.2 [17] shows describes that with a specific network size PEGASIS has constant energy consumption with respect to time while LEACH energy efficiency decreases. The simulations result was done with respect to sensor nodes death to observe the number of rounds of communication for both these protocols LEACH and PEGAIS [18].
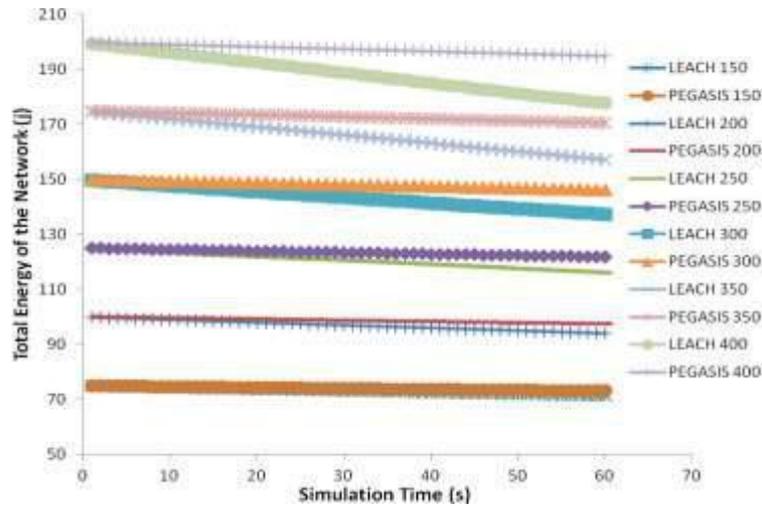
Figure 2. Total energy in a network for different number of nodes

Figure. 3(a) shows that when there is an increase in the percentage of nodes death PEGASIS shows a higher network lifetime in comparison with LEACH. As shown in the Fig. (3b) PEGASIS offers better stability and lifetime for large networks as compared to LEACH.
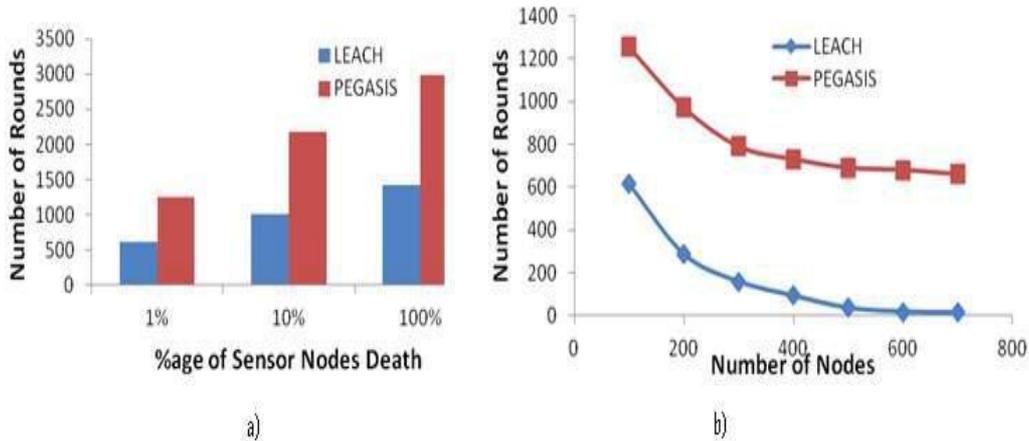

Figure 3. Percentage of Sensor Node Death and Number of Nodes vs. Number of Rounds

V. Conclusion

The result displays delay graph under for LEACH and PEGASIS protocol with CBR traffic and 54 Mb bandwidths. The LEACH has same variation in delay as associated to PEGASIS and at the combined measurement of protocols. In this scenario LEACH has larger sustainability in the position of the speed all the packet size, delay and these term of scenario shows that LEACH has a better compatibility. Throughput with the entire scenario is going to increase also the delay in the same condition. The performance of LEACH is better than as compared to the PEGASIS because all the

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parameters and scenarios are performed on the same bandwidth with the different packet size and the different way.

The analysis shows that PEGASIS offers an extended lifetime of the network because of the energy efficiency.it also shows that PEGASIS performance is better than LEACH in terms of network communication overhead and the percentage of node deaths. For large networks, network lifetime and the early death of the nodes reduces the network stability in LEACH as compared to PEGASIS.

Acknowledgement

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Ahmed Mateen is currently pursuing his Ph.D. Computer Science. From Chongqing university, china. He received the M.Sc. degree from The University of Lahore and M.S. degrees in computer science from the University of Agriculture Faisalabad, Faisalabad, Pakistan. He has an Outstanding Academic Carrier. His research interests are Query Optimization, Modeling and Simulation, Machine Learning, Big Data Analysis and Network Security and Management.

Qingsheng Zhu (M'11) received the B.S., M.S., and Ph.D. degrees in computer science from Chongqing University in 1983, 1986, and 1990, respectively. He is currently a Professor with the College of Computer Science, Chongqing University, and also the Director of the Chongqing Key Laboratory of Software Theory and Technology. His main research interests include Ecommerce, data mining, and service-oriented computing.