COMPARE AND ANALYSES OF OPTIMIZED R-LEACH WITH LEACH ALGORITHM IN WSN

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ABSTRACT

Wireless sensor networks are composed of numerous small charge, little power devices with sensing, local processing and wireless communication capabilities. Minimizing energy consumption and maximizing network lifespan are significant issues in the design of routing protocols for sensor networks. In this paper, we analyses the efficiency of LEACH protocol in extending the existence for energy-constrained wireless sensor networks. Based on LEACH protocol, an enhanced protocol termed as R- LEACH is proposed which aims to diminish energy consumption within the wireless sensor networks. The simulation results suggest R-LEACH protocol could equilibrium network energy consumption and extend the network lifecycle more successfully as compared to LEACH.

KEYWORDS

Wireless sensor networks, energy efficiency, LEACH protocol, Algorithm for LEACH protocol.

I. INTRODUCTION

A wireless sensor network is prepared up of a huge number of sensor nodes and a sink [2]. The WSN is composed of sensor nodes from hundreds or thousands and each node is connected to one sensor nodes. A wireless sensor network made up of a huge number of nodes extends over a exact ssregion. A sensor node self-confident of a sensor, actuators, memory, a mainframe and they do have communication ability. All the sensor nodes are permitted to communicate in the course of a wireless intermediate. The wireless medium is of infrared, radio frequency that having no wired connection attached. So the sensor nodes are deployed in a random manner and it make ad-hoc network because they can communicate themselves [1]. If the node is not capable of communicating with other nodes of the network through straight connection, it means node is not in range. In such kind of networks data transmission from one node to another is performed via in the middle of nodes. This concept is referred as multi-hoping. All sensors nodes work cooperatively to serve the requests [4].

Energy acting a important site in wireless sensor networks because nodes are battery operated. As a result, many protocols have been planned in order to diminish the energy consumption of these nodes such as LEACH [6], PAMAS [5].LEACH is measured as the most designer routing protocol that use cluster based routing in order to reduce the energy expenditure, in this paper we propose an enhancement on the LEACH protocol that further improve the power utilization,

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simulation result transport out that our protocol outperforms LEACH protocol in term of energy expenditure and overall throughput. LEACH is “Low Energy Adaptive Clustering Protocol” [6]. LEACH form clusters and selects arbitrarily cluster Heads for each cluster. Non- cluster heads sense the data and transmit this data to cluster head, and then cluster head combined the data and send to sink. The principle of this protocol is that it assigns overall energy consumption of the network uniformly to each node by selecting periodically different nodes as a cluster head. There are two phases of LEACH that are Setup phase and Steady state phase. In setting up phase, clusters are created and cluster heads are chosen. In steady state phase, data from non-cluster heads is broadcast to sink. The sensor nodes converse with cluster heads with allotted time using TDMA. Cluster heads are randomly selected in all rounds. LEACH process is divided into numerous rounds. Each round starts with set-up phase. In this clusters are planned LEACH set a threshold value T (n) and then sensor node I generate a random digit between 0 and 1. If the random number is $< T(n)$, the node will develop into cluster head for the current round and common nodes join the cluster and turn into cluster members [6].

$$T(n) = \begin{cases} \frac{p}{1-p*(r mod \frac{1}{p})} & if n \in G \\ 0 & otherwise \end{cases} \quad \text{.................. (1)}$$

P is a possibility of the node to be chosen as a cluster head, r is a number of rounds passed, G is the collection of ordinary nodes. One time a node become cluster head never become cluster head yet again, only the node which have not become the cluster head and have high energy can turn into cluster head at r+1.When cluster head assigns time slots to the members using TDMA then it shifted to the steady state phase. After the shifting in steady- state phase, members sent data to cluster heads; cluster head process the data and then send data information to the base station. After these circles, it turns to next round and begins rebuilding new round. Advantages of LEACH are that LEACH is completely circulated. LEACH does not need the control information from the base station and the nodes do not need information of the global network in order for LEACH to function. Disadvantages of LEACH are that the cluster heads are chosen randomly. So the distribution of cluster heads cannot be ensured. In this protocol, the nodes with low energy have similar precedence as the nodes having high energy and nodes having little energy can become cluster heads, but that can’t be used in huge level communication networks [9].

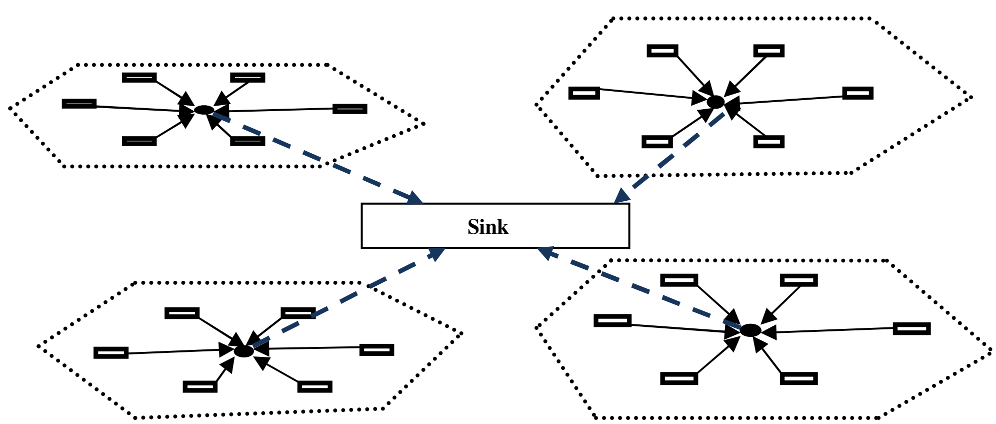

Figure1: LEACH protocol Architecture

In section ii presents the related work, in section iii introduced proposed algorithm for LEACH enhancement, in section iv simulation setup and section v , results and discussion, at last we conclude the paper.

II LITERATURE REVIEW

An optimal energy-saving spare organization, counting spare collection and named it LEACH-SM protocol (modified form of prominent LEACH protocol) was planned by **Baker B. et al.; (2014).**In this paper, author presented a quantitative contrast of energy consumption and WSN life span for both mentioned protocols [12].

Genetic algorithm and optimization of LEACH protocol that are used on LEACH protocol and compare both results on the basis of rounds that was discussed by **Yadav S. et al.; (2014)** . The contrast was based on optimal thresholding possibility for cluster arrangement .Finally, after evaluation finds LEACH-GA method outperforms MTE, DT and LEACH in conditions of network lifetime, use for optimal energy-efficient clustering [10].

The two major clustering protocols, namely LEACH and LEACH-C (centralized), via NS2 tool for frequent selected scenarios, and study of simulation results against chosen presentation metrics with latency and network lifetime was considered by Nayak **P.et al.; (2014).** As a termination of observation from results, it can be mentioned that LEACH can be favored if localized coordination of nodes in clustering without involving BS is of high priority than other factors like assurance over desired number of clusters etc.; and LEACH-C can be chosen when centralized and deterministic approach covering entire network is expected still bringing in increased network lifetime and desired number of clusters [7, 13].

The Enhance version of LEACH protocol called V-LEACH protocol and the comparison of LEACH protocol with V-LEACH protocol was planned by **Ahlawat A. et al.;** from the simulation results were, first the number of alive nodes is more than the original LEACH. Second the number of dead nodes is less than the original LEACH protocol. Network life time is increased by 49.37% then original LEACH [11].

Energy-LEACH protocol improves the CH collection procedure. It makes residual energy of nodes as the main thing which decides whether the nodes twist into CH or not after the initial round. It same as LEACH protocol, was proposed by **Yassein M. et al.; (2009)** E-LEACH is separated into rounds, in the first round, every node has the same opportunity to spin into CH, that mean nodes are arbitrarily chosen as CHs, In the next rounds, the residual energy of each node is dissimilar after one round communication and taken into account for the collection of the CHs. That mean nodes have extra energy will develop into a CHs rather than nodes with fewer energy [6].

A new edition of LEACH called two-level LEACH was proposed by **Kaur A. et al.; (2015).** In this protocol, CH collects data from further cluster members as original LEACH, but somewhat transport data to the BS , it uses one of the CHs that lies between the CH and the BS as a relay station [8].

In LEACH, each CH openly communicates with BS no issue what the distances between CH and BS It will consume a lot of its energy if the distance is far. So overcome this drawback multihop-LEACH protocol was proposed by **Zhou H.** It selects best path between the CH and the BS through other CHs and use these CHs as a relay station to transmit data over through them [6].

The modification of R-LEACH protocol in LEACH protocol enables an alternative node to get replaced in place of a node was proposed by **Ramesh R. et al.; (2014)** which loses its energy such that it extends the life span of the whole network and avoids data loss. The alteration R-LEACH protocol has been implemented with 40 nodes in the network simulator-2 and its packet delivery ratio and energy level has been experimental which is superior than that of existing LEACH [3].

III PROPOSED ALGORITHM FOR LEACH ENHANCEMENT

In LEACH protocol, the chosen of cluster head randomly due to this the energy of cluster head is very low. Cluster heads are in charge not only for sending data to the base station but also for collecting and fusing the data from ordinary nodes in their own clusters. In the process of data collection and broadcast, the energy consumed by data transmission is superior to that of data fusion. If the present energy of a cluster head is fewer or the distance to the base station is much far, then the cluster head will be died rapidly because of a heavy energy burden. To add ress these issues, this article proposes a new improved algorithm R-LEACH (RFID protocol). To overcome the limitation modifies LEACH protocol by embedding communications modes like Active, Ready and Sleep modes in the network. In Active, mode only sensed data, in ready mode sensed as well as transmitting data to the BS as shown in the figure 2. In this scenario , the nodes in orange are CH and is in a ready state used for transmitting data, the node in blue is the base station and a rest of the nodes is in active and sleep state. The node in sleep mode used for saving the energy consumption and also balance the energy loads of the CHs.

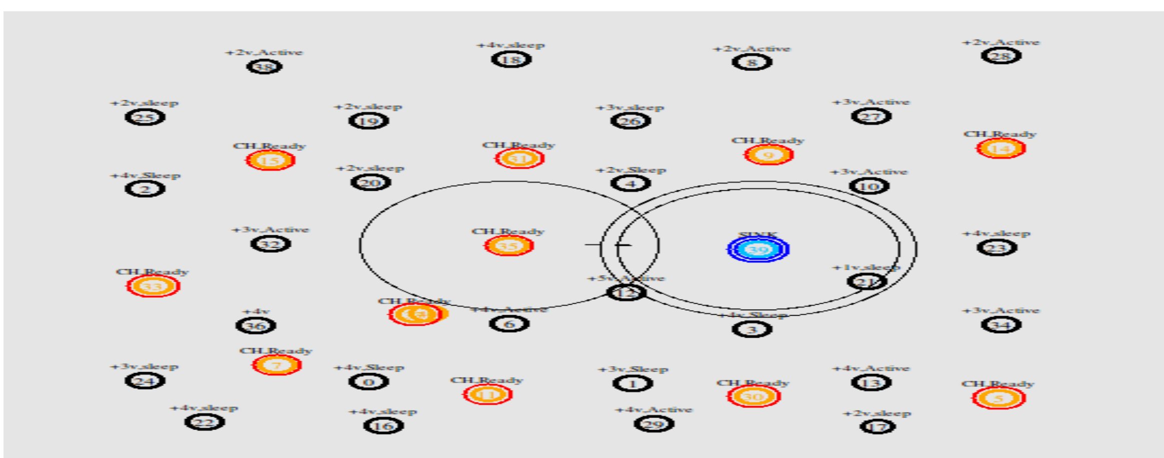

Figure 2: cluster based mechanism use in proposed methodology (R-LEACH protocol)

IV. SIMULATION SET UP

In this section, we evaluate the performance of R-LEACH protocol using NS2 tool and compare its performance with LEACH protocol, using the same initial values and following the same scenario. The algorithm is tested in network simulator version 2. The experiments are performed with a diverse number of nodes placed in an 800m * 800m field. Each sensor nodes is assumed to have an initial energy of 100 joules. The general simulation parameters are

Table 1: NS-2 simulation parameters

parameter	settings
Simulation Area	800*800 meters
No of nodes	41
Channel Type	Channel/wireless
Antennae model	Antenna/omniantenna
Energy model	battery
Interface queue Type	Queue/Droptail/Priqueue
Link layer type	LL
Simulation time	10s
Initial Energy Model	100 J
Routing protocol	AODV
Traffic Source	CBR
Type of MAC	MAC/ 802-11
Packet size	1000 bytes

V RESULTS AND DISCUSSION

To evaluate the performance comparison of LEACH and R-LEACH protocol using parameters such as, Energy consumption, Packet loss, End to End delay, Throughput and control overhead. Calculating the average energy consumption is the measure of rate at which energy is used by sensor nodes in an exacting time. From the graph It is observed that standard the energy consumption for R-LEACH is less as compared to LEACH as shown in Figure 3. every cluster heads directly communication with sink no issue the distance between Cluster head and sink; it will use a more energy if the distance is far [3]. RFID protocols works on modes like active sleep and ready .In RFID some nodes are in sleep modes so energy consumption is to be reduced. In table 2, energy is improved in comparison to the old one. Figure 4 calculates packet loss is the total number of lost of packets during the transmission from source to destination. From the graph it is observed that average of packet loss for R-LEACH is less as compared to LEACH. In

LEACH packet loss is more because the node having short energy is chosen as CH then node will die soon due to which data does not reach to the BS, packet loss is occurred [16]. In Figure 5, calculates the End to End delay as the time taken for a packet to be transmitted across a network form source to destination. The average end to end for R-LEACH is fewer as compared to LEACH protocol because in LEACH protocol energy consumption is high due to this it causes delay for data transmission [14]. In Figure 6, calculates Throughput is the average data packets received at the destination. From the graph, it is observed that the R-LEACH has better throughput as compared to LEACH protocol. In LEACH protocol throughput will be decrease due to high energy consumption, packet loss and overhead [15].In figure 7, calculates control overhead is the ratio between a total number of control packets and total number of packets delivered successfully. From the graph it is observed that LEACH has high overhead due to delay increase [18]. In table 2, calculates the Average of all parameters and R-LEACH is improved in comparison to the old that mean the latest edition of LEACH outperforms the original version of LEACH protocol.

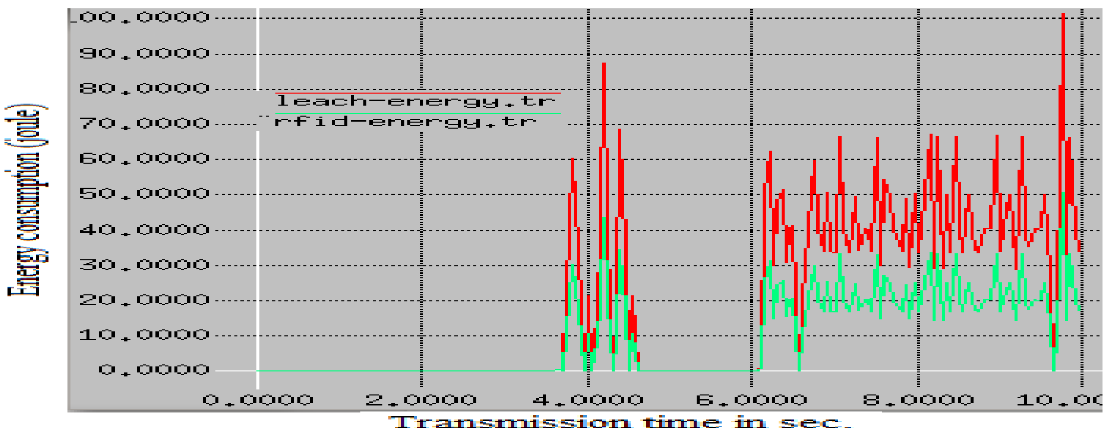

Figure 3: Compared Rfid energy graph with Leach Energy graph.

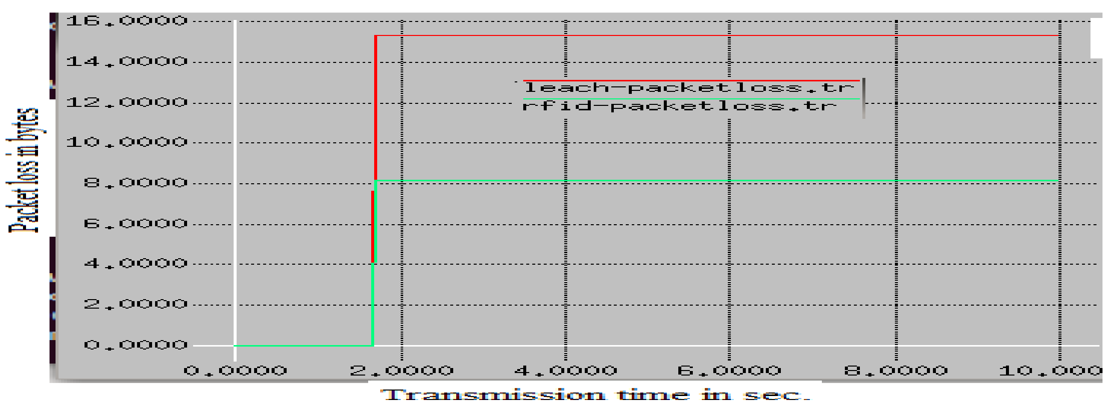

Figure 4: Figure 3: Compared Rfid Packetloss graph with Leach packet loss graph.

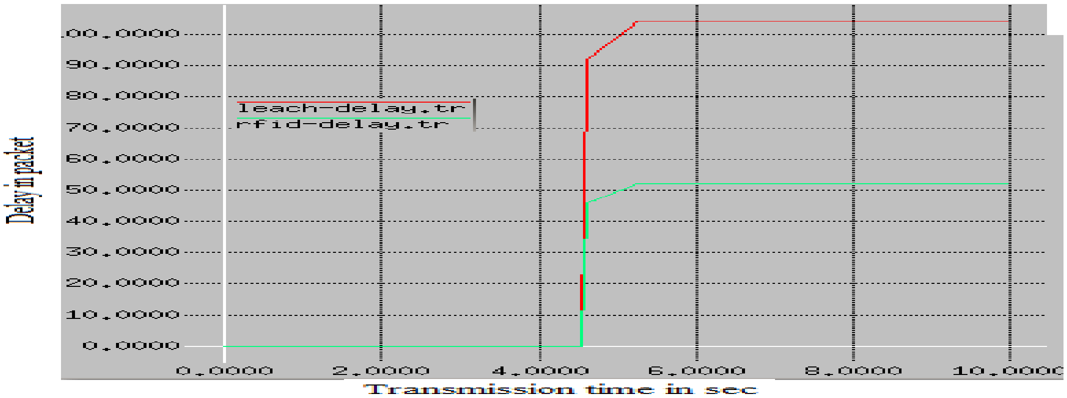

Figure 5: Compared Rfid delay graph with leach delay graph.

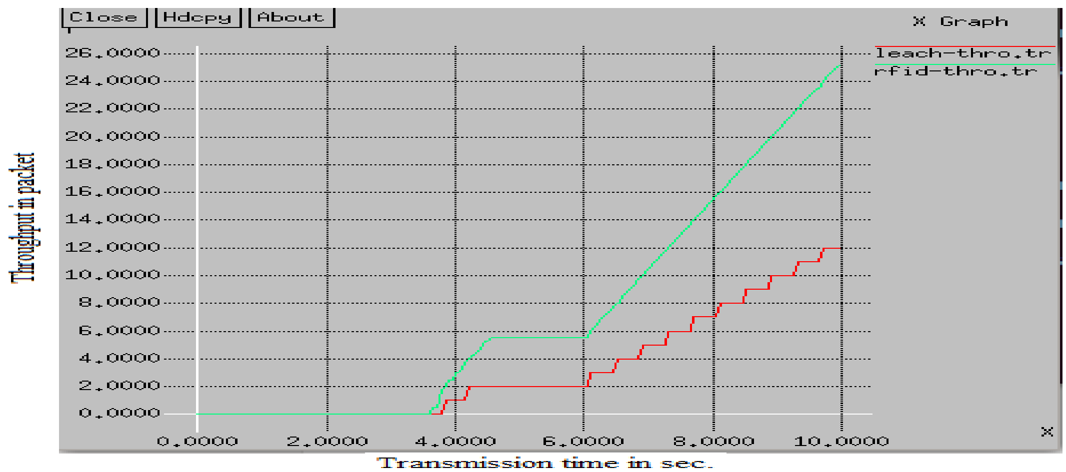

Figure 7: compared Rfid throughput with Leach throughput.

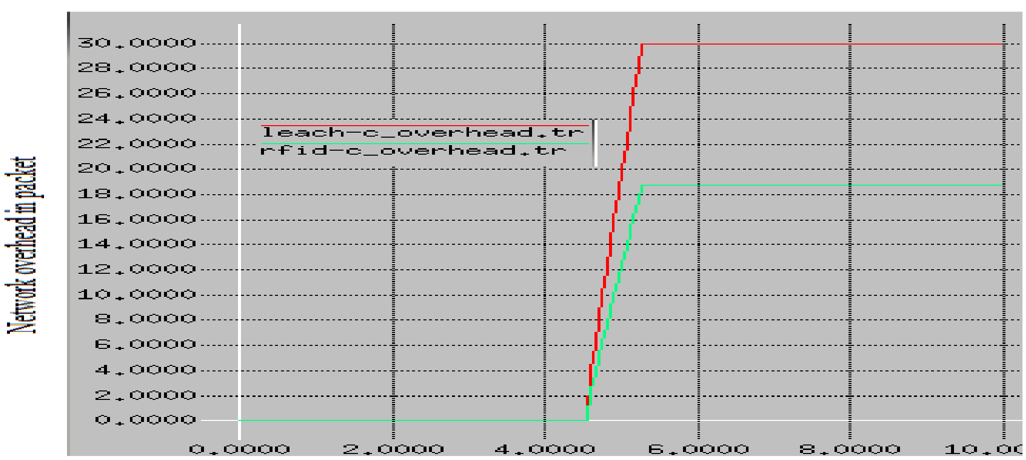

Figure 7: compared Rfid overhead with leach overhead.

VI CONCLUSION

In this paper considered a well- known protocol for wireless sensor networks called LEACH protocol which is the first and the most svery important protocol in wireless sensor networks which uses clusters based distribution techniques followed by an outline of LEACH protocol implementations, then we proposed a new edition of LEACH protocol called R-LEACH protocol. From the simulation results, R-LEACH protocol could balance the energy consumption and enlarge the network life cycle more successfully as compared to original LEACH protocol.

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TABLE 2. Compare the Average value of LEACH and R-LEACH Protocol.

Classification	Energy Dissipation	Packet Loss	End to End Delay	throughput	Control Overhead
LEACH protocol	100 joule	15.8 bytes	100 packets	12 packets	30 packets
R-LEACH protocol	40 joule	8 bytes	50 packets	25.5packets	19 packets