IJCSE International Journal of Computer Sciences and Engineering Open Access
Review Paper Vol.-7, Issue-4, April 2019 E-ISSN: 2347-2693

Review on LEACH (Low Energy Adaptive Clustering Hierarchy) Protocol for Enhancing Energy Efficiency of WSN

Deepika[1*], Anil Sangwan[2]

[1,2]Dept. of Electronics and Communication, UIET, MDU, Rohtak, India

Corresponding Author: deepikachhikara5@gmail.com

DOI: https://doi.org/10.26438/ijcse/v7i4.4143 | Available online at: www.ijcseonline.org

Accepted: 10/Apr/2019, Published: 30/Apr/2019

Abstract- Wireless sensor network (WSN) consists of a number of dedicated sensors which are spatially dispersed for different purposes such as monitoring and recording the various physical conditions of the environment and organising the data collected at a central location for further operations. In wireless sensor networks, the sensor nodes have limited energy which affects the lifetime of the nodes. Hence the system performance can be enhanced by minimising energy dissipation and maximising the lifetime of the nodes in the wireless sensor networks. Low Energy Adaptive Clustering Hierarchy(LEACH) protocol is a very important energy efficient protocol .This protocol improves the method of selection of cluster heads among the various sensor nodes by examining the residual energy of the different nodes and then the node which is having more residual energy is made the cluster head for that group of nodes .This protocol is highly efficient as it reduces energy consumption and decreases system delay which results in improvement of lifetime of the sensor nodes. So, we propose to improve the protocol to enhance the wireless sensor nodes performance through the energy optimisation.

Keywords: WSN, LEACH

I. INTRODUCTION

Wireless sensor network (WSN) is a type of network which consists of a number of nodes i.e. sensors which have limited energy resources for their operation. WSN is used widely now a days for the monitoring purposes as well as collection of data from different environments. These nodes or sensors in WSN have limited lifetime due to the limited energy resources. So, we can use a protocol which can utilise the available limited energy of the sensor nodes to their full potential possible so that maximum energy efficiency can be achieved for the wireless sensor nodes.

Low energy adaptive clustering hierarchical (LEACH) protocol is used for enhancing the lifetime of the wireless sensor nodes by the use of energy optimisation. This protocol is based on the clustering algorithm. LEACH protocol is used for the efficient usage of the available energy resources so that the lifetime of the WSN is enhanced for its network operation.

In this protocol, clustering algorithm is used in which the cluster head selection of the sensor nodes is done by analysing the energy capabilities of the different sensor nodes. In this way, the best possible cluster head is selected for the different clusters of the sensor nodes so that the energy is utilised effectively and efficiently to obtain better lifetime of the sensor nodes.

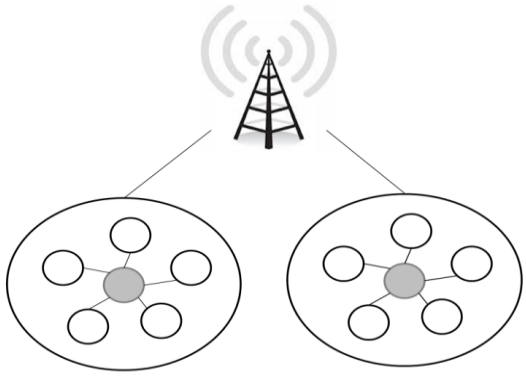

Fig. 1

Cluster based routing in WSN

Clustering based routing protocol groups the different sensor nodes into number of clusters with each having a cluster head. Every sensor node has a gateway to the cluster head. The data collected by the different nodes is passed to the cluster head which then performs required operations on the collected data and then forwards it to base station for the further operations.

II. LITERATURE REVIEW

The main operational concern for the WSN is the energy resources constraint. The limited energy resources of the

sensors play an important role in the functionality of the network as it determines their operational capability. So, achieving energy efficiency for the networks is very important in WSN. Different protocols have been proposed for this on the basis of organisation of network and routing protocols operations. This literature review presents the important energy efficient protocols used in the WSN:

Sunkara Vinodh Kumar and Ajit Pal: - In this research paper, assisted LEACH (A-LEACH) is the main area of focus which helps in obtaining the reduction in distribution of energy dissipation by the use of distinguished tasks for routing and aggregation of data. It provides the details of the helping or assisting nodes which help or assist the cluster nodes in the multihop routing. An algorithm is there for the energy efficiency of the multihop routing for these helping or assisting nodes for arrival to the base station. This protocol leads to reduction in the total energy dissipated by distributing the energy dissipated among sensor nodes, assisting nodes and cluster heads.

M Aslam, N Javaid, A Rahim, U Nazir, A Bibi, Z Khan:- In this paper, the focus is on the exploration of the routing protocols' role in enhancing network lifetime and how to improve the quality of these protocols in WSN . In hierarchical routing protocols the network is divided into number of clusters with a cluster head which results in decrease of the routing overhead. The research has been done for enhancing the network lifetime and the data delivery related factors for the different routing protocols.

S. Ahmed, M., et al. 2011:-The main aim of research paper is to introduce a clustering based algorithm for the WSN called Low Energy Adaptive Clustering Hierarchy (LEACH). In this, a distributed algorithm is used in which the different sensor nodes make autonomous decisions in the network.

Shio Kumar Singh, MP Singh, DK Singh :- In this paper, the author has surveyed and summarised the recent research works on different energy efficient hierarchical clustering based routing protocols for the WSN. On the basis of network, protocols and different routing strategies can be applied for achieving better energy efficiency. In this, the performance of different clustering protocols is studied.

BS Mathapati, SR Patil, VD Mytri:-In this paper, energy efficient reliable routing protocol is studied. Here the clustering approach is used to group the different sensor nodes into the clusters. The data aggregation method is used in this for the network. For the clusters, a cluster head is selected which coordinates with the different nodes of that cluster.

Hiren Thakkar, Sushruta Mishra and Alok Chakrabarty:- This paper proposed energy efficient protocol for the WSN on the basis of energy of sensor nodes for cluster head selection. In this multi level data aggregation is used by the cluster heads. The purpose is to achieve the energy efficient system for the WSN.

Sudhanshu Tyagi, Neeraj Kumar:-In this paper, the main focus is on the protocols for the minimisation of the energy for the wireless sensors during the collection of required data from the particular area. In this ,the different techniques in WSN are studied for the different factors such as management of energy and power, best possible cluster head selection, network lifetime etc.

Sandeep Verma, Richa Mehta, Divya Sharma, Kanika Sharma:-In this paper, the different routing protocols have been surveyed and discussed for increasing the lifetime of the wireless sensor networks by studying the various factors for these protocols.

Md. Faruqul Islam, Yogesh Kumar , Saurabh Maheshwari, Neeti Jain:-In this, a survey has been done on the different clustering protocols of the WSN and the comparison is done for the different protocols for various important factors of the network for analysing the recent trends in the energy efficient protocols.

III. CONCLUSION

The most important factor in the designing of protocols for the WSN is its energy efficiency capability. So the WSN protocols can be modified to achieve optimisation of energy resources of the sensor nodes by the use of appropriate cluster heads in wireless sensor networks with the help of a proper selection method. This leads to reduced energy consumption and thus enabling higher alive time of the sensor nodes of the wireless sensor network with the use of improved LEACH protocol. So, the lifetime of the sensor nodes is enhanced and this enables in achieving higher efficiency in the wireless sensor networks by energy optimisation.

REFERENCES

[1]. Sunkara Vinodh Kumar and Ajit Pal "Assisted-Leach (A-Leach) Energy Efficient Routing Protocol for Wireless Sensor Networks", International journal of computer and communication engineering, Vol. 2, No. 4, pp. 420-424, 2013.

[2]. Shio Kumar Singh, M P Singh and D K Singh, "A Survey of Energy-Efficient Hierarchical Cluster-Based Routing in Wireless Sensor Networks", International Journal of Advanced Networking and Application Volume 02, Issue 02, Pages: 570-580, 2010.

[3]. BS Mathapati, SR Patil, VD Mytri, "Energy efficient reliable data aggregation technique for wireless sensor networks", International Conference on Emerging Technology Trends in Electronics, Communication and Networking, 1-6, 2012

[4]. Hanady M. Abdulsalam and Layla K. Kamel, "W-LEACH Weighted Low Energy Adaptive Clustering Hierarchy Aggregation Algorithm for Data Streams in Wireless Sensor Network", IEEE International Conference on Data Mining Works, pp. 1 -8, 2010.

[5]. Bilal Abu Bakr and Leszek Lilien, "Extending Wireless Sensor Network Lifetime in the LEACH-SM Protocol by Spare Selection", Fifth International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing, pp. 277-282, 2011.

[6]. Hiren Thakkar, Sushruta Mishra and Alok Chakrabarty, "A Power Efficient Cluster-based Data Aggregation Protocol for WSN", International Journal of Engineering and Innovative Technology (IJEIT) Volume 1, Issue 4, April 2012.

[7]. Parul Khurana and Inderdeep Aulakh, "Wireless Sensor Network Routing Protocols: A Survey", International journal of computer applications, vol. 75, No. 15, 2013.

[8]. Md. Faruqul Islam, Yogesh Kumar , Saurabh Maheshwari, Neeti Jain ," Recent trends in Energy Efficient Clustering in WSN", International Journal of Computer Applications, vol. 95, No.20, pp. 44-48,2014.

[9]. Pankaj Chauhan and Tarun Kumar," Power Optimization in Wireless Sensor Network: A Perspective", International Journal of Engineering and Technical Research (IJETR), vol. 3, issue 5, May 2015

[10]. Amit Bhattacharjee, Balagopal Bhallamudi and Zahid Maqbool, "Energy- Efficient Hierarchical Cluster Based Routing Algorithm in WSN: A Survey ", International Journal of Engineering Research & Technology (IJERT), Vol.2, Issue 5, may, 2013, pp.302-311

[11]. Sandeep Verma, Richa Mehta, Divya Sharma, Kanika Sharma, "Wireless Sensor Network and Hierarchical Routing Protocols: A Review", International Journal of Computer Trends and Technology(IJCTT), Vol.4, Issue 8, August 2013,pp.2411 -2416

[12]. M Aslam, N Javaid, A Rahim, U Nazir, A Bibi, Z khan, "survey of extended LEACH clustering routing protocols for wireless sensor networks",2012 IEEE 14TH International Conference on High Performance Computing and Communication and 2012 IEEE 9TH International Conference on embedded software and systems,1232-1238,2012

[13]. Sudhanshu Tyagi, Neeraj Kumar,"A systematic review on clustering and routing techniques based upon LEACH protocol for wireless sensor networks", Journal of Network and Computer Applications 36(2), 623-645, 2013

[14]. Meena Malik, Yudhvir Singh, Anshu Arora,"Analysis of LEACH protocol in wireless sensor networks", International Journal of Advanced Research in Computer Science and Software Engineering 3(2), 2013

[15]. M Shankar, M Sridar, M Rajani, "Performance evaluation of Leach Protocol in wireless network", International Journal of Scientific and Engineering Research 3(1), 1, 2012

