

A Review on Clustering Approach: LEACH and its Protocols

Kavyashree E.D
Dept.of Computer Science
GSSSIETW, Mysore

Gagana M.S
Dept.of Computer Science
GSSSIETW, Mysore

ManjuPrasad B
Assistant Professor, CSE
GSSSIETW, Mysore

Abstract:- One of the recent trends in wireless communication and gaining interest in research areas is WSNs. It is an assortment of network device called sensor nodes which is distributed over geographical region in ad-hoc manner. Nodes or sensor nodes or motes which communicate wirelessly. Growth usage of WSNs is increasing dramatically day by day. Sensor nodes have a very restricted number of resources. Many existing research works aims to achieve WSNs objective s and they have to update regularly as technology grows. Clustering approach is the best way to reduce energy dissipation during communication in WSNs. One of the famous clustering protocols is leach .Recent trends in WSNs are IoT (Internet of Things) and big data. This paper outlines the resource constraints in WSNs, clustering algorithm in leach and descendant protocols in leach.

Keywords: Clustering Protocols, LEACH, Network Routing, Wireless Sensor Networks.

I. INTRODUCTION

The collection of sensor nodes which are distributed across geographical region in ad-hoc manner known as WSNs. The main building block of networks is sensor nodes. Sensor Nodes are transducer which process physical or any other environment conditions such as heat, light, vibration, motion, sound, etc into electrical signals. Sensor nodes or motes infrastructure are tiny in size, low cost, disposable and self contained battery powered computers. Each node has sensors embedded within them and the application running in the nodes. Platform of sensor node composed of CPU, power supply and radio. The figure below shows the sensor node representation [3].To achieve clustering many protocols are used based on the scenarios, protocols used are LEACH, SEP, EBHC, HEED, and EEHC. Out of this LEACH gives the fundamental idea for clustering.[1][2]

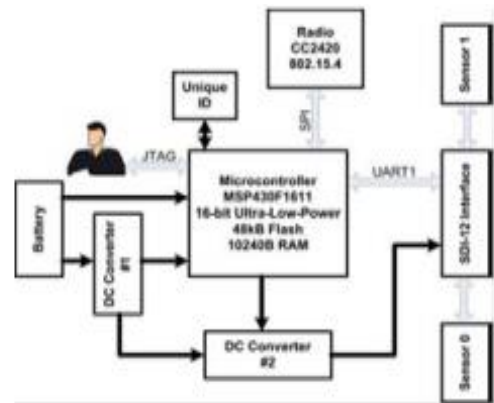


Fig 1: Block diagram of Sensor Node [3].

II. CLUSTERING APPROACH IN LEACH

Clustering is best routing algorithms aims to reduce power consumption in sensor networks. The first algorithm to focus on clustering was LEACH. It is the self-organizing and adaptive clustering protocol. Operation takes place with the rounds. Rounds consist of setup phase –cluster formation and steady phase–when data transfer to sink node occur. Random election of cluster head is to evenly distribute energy among nodes. Cluster head is elected by sensor nodes based on probabilistic approach. The communication among cluster uses TDMA approach and node send data to cluster head based on allocated time slot [2][15][16].

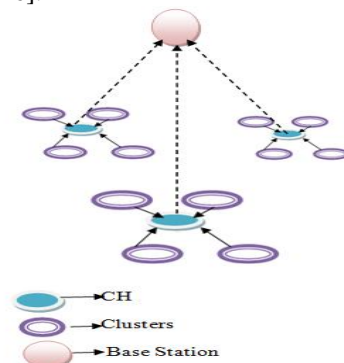


Fig 2: Structure of cluster approach in Leach

III. LITERATURE SURVEY

Andhe Dharani et,al[4]: In Sensor networks nodes are used to sense the data in environmental conditions such as temperature, sound, pressure, pollutants, vibrations at different regions. Here we represents the significance of WSNs and also identifies its energy effecting parameters such as battery, memory, sensor, processor, and radio.

*Manju Prasad et,al[5]:*This paper briefs about the performance of networks, in the form of energy where energy is the critical issue in networks. Clustering based algorithm such as LEACH, SEP protocols improve the energy efficiency in networks. Leach protocol is a TDMA based MAC protocol. Residual based energy routing algorithm is used to enhance the performance in the networks. Residual energy totally depends on the cluster head which consists of cluster and sensor nodes.

Ravneet Kaur et,al[6]: This paper represents the significance of the WSNs by extending the lifetime of sensors, by evenly distributed energy load among all the sensor nodes so methods are proposed to avoid the draining in sensor nodes. LEACH is the fundamental routing protocols used for clustering mechanisms and descendants of leach protocols are discussed.

Shantharam Nayak et,al[7]: Various simulation tools which are compatible for WSNs such as Ommnet++, Matlab Simulink, Tossim, NS2, NS3, Contiki, OMNet++, Castalia, J-Sim, QualNet, TOSSIM are discussed along with the various factors.

Reshma I. Tandel et,al[8]: This paper identifies Cryptography-based approaches such as F-LEACH, SLEACH, SHEER, Sec-LEACH, SS-KEACH, RLEACH. Non-cryptography based approaches such as signal strength based approaches, advantages and disadvantages of LEACH, and attacks on leach are Sybil attack, selective forwarding, and HELLO folding attack.

Manju Prasad B et, al[9] This paper discuss about one of the efficient routing mechanisms in WSNs is clustering routing. Efficient mechanism like hierarchical, multi hop and distance based clustering can enhance the performance in sensor networks for unification of clustering. If clustering mechanism is not used appropriately it can create variety of problems such as selecting least energy node as the cluster head, and selection of many cluster head within the same region.

IV. LEACH DESCENDANTS PROTOCOLS

LEACH descendants protocols are LEACH-A, LEACH-B, LEACH-C, LEACH-E, LEACH-F, LEACH-L, LEACH-M, LEACH-S, V-EACH, TL-LEACH, LEACH-MOBILE, CELL-LEACH, and Multi-Hop LEACH.

E-LEACH (Enhanced-Leach or Energy-Leach)

E-LEACH- Routing protocol solves the energy consumption problems in sensor nodes [10].

Main Objective

- Handling failures in cluster-head.
- Handle dynamic residual energy and non-uniform energy in nodes.

E-LEACH is the enhancement of leach. Working principle is same as the leach. Overall cluster head in the sensor network is the prime factor which reflects the performance of hierarchical routing protocol [10][11][12].

TL-LEACH (Two Levels LEACH)

Reduce the nodes to transmit to the sink node, and total energy consumption in the node [13]. It collects the data as Leach but Two Level LEACH relays directly to the destination node. It selects the cluster head among the cluster head and sends data to the sink node [12].

M-LEACH (Multi-Hop Leach)

Multi-Hop is based on clustering routing algorithm. Reduce the data energy consumption from cluster head to sink node. Energy consumption depends on distance as diameter increases energy consumption increases in nodes. Multi-hop allows no direct communication between cluster head and base station due to the distance between them [10][11][12].

LEACH-A (Advanced –Leach)

Transferring data from cluster head to base station directly consumes more energy than other nodes in network [13]. Mobile agent technique is used to process data. This protocol main objective is to decrease the probability of node failure and also used for energy saving, and transferring data in a reliable way [11][14].

LEACH-B (Balanced – Leach)

Leach B is more efficient than the Leach protocol. Sensor nodes have information between its position and the destination node. It does not carry information about the other nodes. Objective includes cluster formation, protocol used for cluster head selection, and transmission data using multiple accesses [11].

V-LEACH (Vice Cluster Head Leach)

Issues in Leach such as when cluster head is unable to reach the sink node containing cluster information, and random selection of cluster head leads to unbalanced where it can reach some part of the network and unreachable to reach other network areas [10]. To resolve this problem V-LEACH came into existence with the concept of alternate cluster head called vice cluster head. Objective make sure

that cluster head reaches destination. A Vice-CH is selected when working cluster head dies [10].

LEACH-C (Centralized LEACH)

Centralized clustering algorithm involves. Steady phase is same as the LEACH set up phase is quite different. Sensor node sends information to the sink containing its location and energy level [11]. The sensor nodes with minimum energy are not elected as the cluster head, cluster head is selected based on the energy level which is greater than the average node. So the selection of cluster head plays a vital role in lifetime of sensor networks [10] [11].

LEACH-F (Fixed number of clusters, Leach)

LEACH F provides the fixed number of cluster and no network setup at the beginning of each round. For the clusters decision the LEACH-F perform the operations of the same centralized cluster routing algorithm. Once the process starts working new node cannot be added and if node dies during process it cannot adjust to the behavior. Once the cluster is formed it is maintained through the lifetime of the network, so it avoid re clustering [11][14].

V. CONCLUSION

Networks known as sensor nodes, which sense process and communicate with nodes. To enhance the performance of nodes clustering algorithm is used. LEACH is the fundamental algorithm which enhances the efficiency in nodes. Leach descendant protocols also increase the performance in networks.

REFERENCES

- [1] Manjuprasad B, Andhe Dharani, Necessitate for Security in WSNs and its Challenges. IJRCAIT, Volume 1, Issue 1, July-September, 2013, pp. 21-25.
- [2] Manjuprasad, Dharani A, Vijaylakshmi, V Singh, Power Estimation in WSNs by Clustering Mechanism, IJSER, Volume 4, Issue 8, August 2013 ISSN2229-5518.
- [3] Andhe Dharani, Vijayalakshmi M.N, Manju Prasad, Vijay Singh, An Epigrammatic Study of some of the Fundamental Concepts in WSNs, IJETAE, Website: www.ijetae.com (ISSN 2250-2459, Volume 2, Issue 9, September 2012).
- [4] Manjuprasad, Andhe Dharani, Vijaylakshmi, V Singh, Power Estimation in WSNs by Clustering Mechanism, IJSER, Volume 4, Issue 8, August 2013 ISSN2229-5518.
- [5] MANJU PRASAD, ANDHE DHARANI, M. N. VIJAYLAKSHMI & VIJAY SINGH, RESIDUAL ENERGY BASED CLUSTERING ALGORITHM FOR MOBILE NODES IN SENSOR NETWORKS, IJCNWMC ISSN 2250-1568 Vol. 3, Issue 1, Mar 2013, 281-288.
- [6] Ravneet Kaur, Deepika Sharma and Navdeep Kaur, Comparative Analysis Of Leach And Its Descendant Protocols In WSNs, International Journal of P2P Network Trends and Technology- Volume3 Issue1- 2013.
- [7] Dharani A1, Shantharam Nayak2, Manjuprasad B3, Hardware and Simulation Perspective Study on WSNs. IJAFRC, Volume 1, Issue 7, July 2014. ISSN 2348 – 4853.
- [8] Reshma I. Tandel, Leach Protocol in WSNs: A Survey, Reshma I. Tandel / (IJCSIT) IJCSIT, Vol. 7 (4), 2016, 1894-1896.
- [9] Manjuprasad B, Andhe Dharani, Uniform Multihop Clustering for Low Communication Overhead in Sensor Network, IEEE Conference, C2SPCA- 2013.
- [10] S Choudhary1, S Sharma2, IJARCSSE, Vol. 4, Issue 1, January 2014.
- [11] J. Gnanambigai1, Dr. N. Rengarajan2, K. Anbukkarasi3, "Leach and Its Descendant Protocols: A Survey" IJCCT, Vol. 01, No. 3, Issue: 02 September 2012.
- [12] Ravneet Kaur1, Deepika Sharma2, Navdeep Kaur3, "Comparative Analysis Of Leach and Its Descendant Protocols In WSNs" International Journal of P2P Network Trends and Technology-Vol. 3, Issue 1-2013.
- [13] M. Usha1, Dr. N. Sankarram2, IJIRCCE, Vol. 2, Special Issue 1, March 2014.
- [14] P. Manimala1, R. Senthamil selvi2, IJETAE Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Vol. 3, Issue 12, December 2013).
- [15] W. R. Heinzelman, A. Chandrakasan, and H. Balakrishnan. Energy efficient communication protocol for micro wireless microsensor networks. International Conference on System Sciences, January 2000.
- [16] G Zachár and G Simon, "Providing energy efficient mobility in TDMA controlled WSNs", University of Pannonia Dept. Computer Science and Systems Technology Veszprém, Hungary 978-1-4577-1772-7/12/\$26.00 ©2012 IEEE.