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A Review Based on Energy Efficient Network in WSN Environment

Nidhi Patel[1], Rupesh Dubey[2]
Research Scholar, IPS Academy Institute of Engineering & Science, Indore[1]
Associate Professor (ECE), IPS Academy Institute of Engineering & Science, Indore[2]
nidhipatel29994@gmail.com[1]

Abstract: *Wireless sensor network consists of small number of various nodes deployed in area for data sensing, assembling and, forwarding. The energy of sensor node slowly depletes duting data transmission phase. Routing technique are employed for achieving longer life time of nodes. In this paper, a review of the low energy-based topology being termed as low-energy adaptive clustering hierarchy (LEACH) & chain based routing(PEGASIS), Leach Protocol is very much symbolic for cluster-based network whereas PEGASIS routing for chain based routing network. LEACH protocol is very much symbolic in the small area network. After studying various variants of LEACH, the research gap is being brought under the spotlight to enhance network lifetime.*

Keywords: *WSN, Routing Protocols, PEGASIS, LEACH, Power Consumption.*

1. INTRODUCTION

Wireless Sensor Network (WSN) consists of two main components 1. Base Station 2. Sensor Nodes. Nodes are used for monitoring sensing the data and send info wirelessly to BS or amongst nodes. The nodes monitor various environmental conditions (temperature, pressure, sound) and share (wirelessly) the information obtained with either the base station or amongst various nodes. WSN is foreseen to be appropriate solutions to many applications in fields of defense, industry monitoring, health monitoring, and more.Specific, data-centric protocols are the need for these sensor networks. The protocols should be able to collect data and optimize energy consumption. The sensor nodes are programmed for monitoring or collecting data from the surroundings (environment) and passing the information to the base station. The protocol is required for remote user access via different communication technologies. Development of tiny, low cost, low power, multi-functional smart sensor nodes has been made possible owing to the recent technological advancements in the fields of WSN, Wireless communication techniques, and Micro-electro-mechanical systems (MEMS). The features of wireless sensor networks are listed below:

- *Varying network size*: The size of a sensor network can vary in size (1-100 nodes)
- *Low cost*: Sensor nodes should be inexpensive so that they can be used in large numbers
- *Long lifetime network*: Efficient protocols have to be designed and implemented so that the network can last as long as possible.
- *Self-organization*:sensor nodes of WSN should be able to form automatic network without external configuration.
- *Cooperation/Data aggregation*: Sensor nodes should be able to aggregate data in a meaningful way that would improve network efficiency.

Fig.1 shows architecture of WSN. It is shown that data collected from the sensing region are forwarded to the sink through the nodes, and after that, it is forwarded to the user via the internet [1]. The sensor nodes are wirelessly connected.Fig. 1 Shows architecture of WSN.

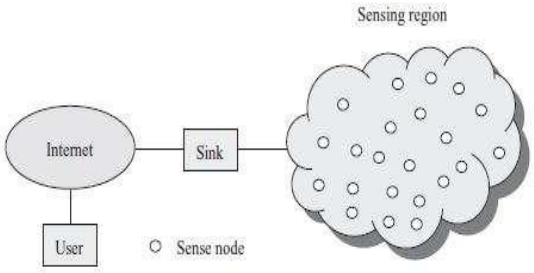

Fig.1 Wireless Sensor Network [3]

It's the routinethat decides which node has to pass data to the other node in a particular determined path. So, routing becomes an essential element for energy-saving and making the network operating for a more extended period [2-3]. Fig. 2 shows three types of routing. An example of hierschical routing is PEGASIS [4] in which differe t levels are formed through which data is forwarded to based station.The objective of the paper is to enhance the network life time of nodes which are deployed in data sensing areas.

In this paper, section I contain an introduction, section II contains Design constraints for routing in WSNs; section III contains LEACH, section IV contains Pegasus based protocol, section V contains Previous Work, section VI contains Conclusion.

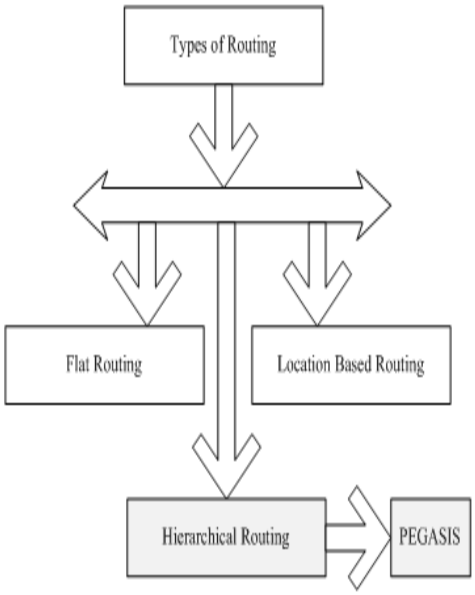

Fig.2 Types of Routing in WSN [4]

2. DESIGN CONSTRAINTS FOR ROUTING IN WIRELESS SENSOR NETWORKS

Following are design constrains for routing protocol:

- ✓ **Autonomy**: There is no dedicated unit in WSN for seing the operation of control of radio and routing resources. The routing decisions are taken on the basis of network routes.
- ✓ **Energy Efficiency**: Aim of routing protocol to maintain prolong network life time along with maintain good grade of connectivity between nodes.
- ✓ **Scalability**: It must be scalable means can have flexibility in expansim& compression.
- ✓ **Resilience:**Routing protocall must tackle condition of sensor failior either due to inmironmental condition or due to drain of batwary.
- ✓ **Device Heterogeneity**: Network must be adaptable to different types of Nodles with different processors, tranreciver, sensing components, and power unites

3. LOW-ENERGY ADAPTIVE CLUSTERING HIERARCHY (LEACH)

In LEACH, the clustering task is rotated between the nodes, based on duration. LEACH is based on an aggregation (or fusion)technique that aggregates the novel data into a smaller size of data that carries only coherent information to all individual sensors. LEACH is wholly distributed and requires no global knowledge of the network. In LEACH protocol single-hop routing is used where each node can transmit directly to the cluster-head and the sink.

4. PEGASIS BASED PROTOCOLS

Still, PEGASIS had certain deficiencies. The below describes protocols are various PEGASIS based protocols that are designed to overcome those deficiencies. Each protocol takes into consideration unique factors and proposes its different versions.

5. PREVIOUS WORK

Multi-Chain Model of PEGASIS

Their considerations are supportive in diminishing the delay in data delivery and distances between the connected nodes through shorter chains. Sink mobility not only decreases the load on the chain leaders in opening rounds but also shortens the stress on unused nodes at the end of

network lifetime. They also propose an algorithm for fixed path sink mobility in their design. Sink mobility has asignificant gain on the static sink in enhancing the network lifetime.

Chain Based Greedy Algorithm (CBGA)

A new algorithm for gathering the data in WSN based on chain forming using a greedy algorithm. It targets equally circulate the energy load over the whole network nodes. To advert fast node dying, the leader role is better distributed over nodes. It is based on their required energies to transmit to the sink. Thus, the unified network nodes would have the same lifetime and then, as a result, the network lifetime would be protracted. The proposed technique allows balancing the transmission energy correctly over the whole network nodes, which leads to the network lifetime extension. The simulation results show the improvement provided by this technique compared to the well-known protocol for chaining in wireless sensor networks.

Chain-Chain Based Routing Protocol (CCBRP)

This protocol achieves minimum energy consumption and delay. The CCBRP protocol mainly divides a WSN into several chains using the Greedy algorithm and runs in two steps. In the first step, sensor nodes in each chain transmit data to their chain leader nodes in parallel. In the second step, all chain leader nodes form a chain and randomly choose a leader node then all nodes send their data to this chosen leader node. This chosen leader node fuses the data and forwards it to Base Station (BS). Experimental results demonstrate that the energy consumption of the proposed CCBRP is almost as same as for PEGASYS and 60% less than LEACH and 10% less than CCM for WSN with hundred nodes distributed in the 100m x 100m area. The delay of the proposed CCBRP is the same as of LEACH and CCM but 75% less than of PEGASIS.

Reliability

Each sensor is defined with limited energy. Wireless sensor nodes utilized into the network to monitor the physical or environmental conditions such as temperature, sound, vibration at a distinct location. The protocol laysa significant role, which decreases the delay while offering high energy efficiency and long span of network endurance. One of such protocol is PEGASIS, and it is placed on the chain architecture, every chain has only one cluster head, this cluster head is in charge with every note's receiving and sending messages who reside to this chain, the cluster head depleted considerable energy and the times of every round growing. In PEGASIS, it takes advantage of sending data to its closest neighbor, it saves the battery for WSN and growing the period of the network. The proposed work in this paper is about to select the next neighboring node reliably.

Power-efficient hierarchical routing protocols

In a hierarchical structure, more prominent energy nodes can be used to process and send the information, while low energy nodes can be used to execute the sensing in the adjacency of the destination. This means that the creation of clusters and assigning individual tasks to cluster heads can significantly contribute to overall system scalability, period, and energy decisive. For lower energy consumption within the Hierarchical cluster, routing is adopted and to decrease number of transmitted messages to the BSdata aggregation, and fusion is used. Hierarchical routing is mostly two-layer routing, where the selection of cluster heads is made by one layer and the other layer is utilized for routing.

Environmental Monitoring Application. Clustering and routing are the two areas that are given more attention. This work is on the attempt to reduce the power consumption of nodes by concentrating on the radio. The Cluster-based sleep/wake-up scheduling process is approved in a simulated WSN, and it validates to be decisive. Network Simulator (Ns-2) is used in this work for Simulation. The WSN is simulated by applying the clustering technique to the tree topography established by Shortest Hop path Tree (SPT) and Minimum Spanning Tree (MST). The clustering of nodes in an MST gives the best results. The proposed scheduling algorithm is entirely TDMA based. It helps to reduce the energy depletion by reducing the number of times; a node has to move upward, during a slot of time, to be inactive mode. The underlying concept in this paper is the efficient usage of energy.

Energy decisive Cluster-Chain based Protocol(ECCP)

For wireless sensor networks that target at protracting the lifetime of the network, increase stability period, and balancing energy absorption among sensor nodes. ECCP conducts sensor nodes into clusters by using multiple metrics and constructs a chain among the sensor nodes within the cluster so that each sensor node receives from a previous neighbor and transmits to a next neighbor. ECCP also accepts chain based data communication mechanism for transmitting data packets from the cluster heads to the BS. By chaining the nodes in each cluster and using an isolated chain for the cluster heads, ECCP offers the improvement of small transmit distances for most of the nodes and thus helps them to be operational for a more extended period by conserving their limited energy. The performance of ECCP is comparing with LEACH, CBRP, and PEGASIS. The simulation results

show that ECCP is more efficient in terms of network lifetime, stability period, instability period, adjusting energy expenditure among sensor nodes.

Routing Protocol	Routing technique	Data Aggregation	Scalability	Query Based	Overhead	Power Usage	QoS	Energy consumption
AODV	Reactive	No	High	Yes	Low	Low	High	moderate
DSDV	Proactive	No	Low	No	High	High	Low	High
AOMDV	Reactive	No	High	Yes	Low	Low	Moderate	high
PEGASIS	Hierarchical	No	Good	No	Low	Max	No	low
LEACH	Hierarchical/ Node centric	Yes	Good	No	High	High	No	Low(cluster network)
DD	Flat/Node Centric	Yes	Limited	Yes	Low	Limited	No	high
TEEN APTEEN	Hierarchical	Yes	Good	No	High	High	No	moderate

6. Conclusion

Wireless sensor networks have fascinated much concern for both civil and military applications. Examples consist of environmental monitoring, border protection, battle-field, and security surveillance. In these applications, a vast number of sensors are needed, requiring careful architecture and network management. To support scalability, grouping nodes into clusters has been a popular method in WSNs. In this work, we surveyed the status of research and classified the different clustering methods. This paper classifies the taxonomy of cluster-based routing protocols. In this work, we focus on the merits and limitations of different cluster-based routing protocol with energy consumption. Based on the comparison between different schemes, it is clear that cluster-based routing protocols with energy consumption are useful in performance improvement of wireless sensor networks. This paper is beneficial for the research group interested in the development, modification or optimization of routing algorithms for energy-efficient routing WSNs.

REFERENCES

[1] Akyildiz, I.F.,W. Su, Y. Sankarasubramaniam, E. Cayirci, "A Survey on Sensor Networks," IEEE Communications Magazine, Vol.40, pp.102-114, August 2002.

[2] Jamal N, Al-Karaki, Ahmed E Kamal, "Routing techniques in wireless sensor networks: a survey," IEEEjournal on Wireless Communication, Vol.11, No.6, pp.6-28, 2004.

[3] Seema Bandyopadhyay and Edward J., Coyle, "An Energy-Efficient Hierarchical Clustering Algorithm for Wireless Sensor Networks." IEEE Conference INFOCOM, pp. 189-200, 2003.

[4] Stephanie Lindsey and Cauligi S. Raghavendra," PEGASIS: Power-Efficient Gathering in Sensor Information Systems," IEEE Aerospace Conference Proceeding, pp.1125-1130, 2002.

[5] Wendi B. Heinzelman, Anantha P. Chandrakasan, Hari Balakrishnan, "An Application-Specific Protocol Architecture for Wireless Microsensor Networks," Proceedings of IEEE Transactions on Wireless Communications, Vol.1, No.4, October 2002.

[6] YU Yong-chang, Wei Gang, "An Improved PEGASIS Algorithm in Wireless Sensor Network," Acta Electronica Sinica, vol.36, pp.1309-1313, July 2008.

[7] Mohsin Raza Jafri, Nadeem Javaid, Akmal Javaid, Zahoor Ali Khan, "Maximizing the Lifetime of Multi-chain PEGASIS using Sink Mobility," Mar 18, 2013

[8] Ouadoudi Zytoune1 and DrissAboutajdine, "A Lifetime Extension Protocol for Data Gathering in Wireless Sensor Networks," International Journal of Innovation and Applied Studies ISSN 2028-9324 Vol. 4 No. 3 Nov. 2013, pp. 477-482

[9] Samia A. Ali and Screen K. Refaay, "Chain-Chain Based Routing Protocol," IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 3, No. 2, May 2011.

[10] Tarun Gulati and Sunita Rani, "An improved pegasus protocol to enhance energy utilization in WSN," International Manuscript ID: ISSN2249054X-V2I3M7-052012 volume 2 issue 3 May 2012.

[11] Nisha Sarwade, Sanjay Waware, and Pallavi Gangurde, "A Review of Power Efficient Hierarchical Routing Protocols in Wireless Sensor Networks," International Journal of Engineering Research and Applications (IJERA) Vol. 2, Issue 2, Mar-Apr 2012.

[12] Rathna. R and Sivasubramanian, "Improving energy efficiency in wireless sensor networks through scheduling and routing," International Journal Of Advanced Smart Sensor Network Systems (IJASSN), Vol 2, No.1, January 2012.

[13] RaziehSheikhpour, Sam Jabbehdari, and Ahmad khademzadeh, "A Cluster-Chain based Routing Protocol for Balancing Energy Consumption in Wireless Sensor Networks," International Journal of Multimedia and Ubiquitous Engineering Vol. 7, No. 2, April 2012

[14] Se-Jung Lim and Myong-Soon Park, "Research Article Energy-Efficient Chain Formation Algorithm for Data Gathering in Wireless Sensor Networks," International Journal of Distributed Sensor Networks Volume 2012, Article ID 843413, 9 pages DOI:10.1155/2012/843413 July 2012.

[15] Madhuri Gupta, Laxmi Saraswat, "Energy-Aware Data Collection in Wireless Sensor Network Using Chain Based PEGASIS," IEEE International Conference on Recent Advances and Innovations in Engineering (ICRAIE-2014), pp.1-5, May 09-11, 2014.