© INTERNATIONAL JOURNAL FOR RESEARCH PUBLICATION & SEMINAR
ISSN: 2278-6848 | Volume: 06 Issue: 02 | May – June 2015

ANALYSIS AND IMPROVEMENT OF LOW ENERGY NODES USING AN ENERGY EFFICIENT ALGORITHM IN A WIRELESS SENSOR NETWORK IN NS/2

*Neelam Narwal, **Milan Bajaj Asst. Professor,
Bahra Institute of Managment and Technology.

Abstract: A sensor network is a deployment of massive numbers of small, inexpensive, self-powered devices that can sense, compute, and communicate with other devices for the purpose of gathering local information to make global decisions about a physical environment". Sensor networks are composed of thousands of resource constrained sensor nodes and also some resourced base stations are there. All nodes in a network communicate with each other via wireless communication. Moreover, the energy required to transmit a message is about twice as great as the energy needed to receive the same message. The route of each message destined to the base station is really crucial in terms network lifetime: e.g., using short routes to the base station that contains nodes with depleted batteries may yield decreased network lifetime. On the other hand, using a long route composed of many sensor nodes can significantly increase the network delay.

[I] INTRODUCTION TO WIRELESS SENSOR NETWORK

Wireless sensor networks involve deploying a large number of small nodes. A wireless sensor network consists of hundreds or thousands of low cost nodes which could either have a fixed location or randomly deployed to monitor the environment. Basically wireless sensor networking is used for monitoring the physical conditions such as weather conditions, regularity of temperature, different kinds of vibrations and also deals in the field of technology related to sound.

WSNs have some unique characteristics. These are:

- Sensor nodes are small-scale devices with volumes approaching a cubic millimeter in the near future. Such small devices are very limited in the amount of energy they can store or harvest from the environment.
- Nodes are subject to failures due to depleted batteries or, more generally, due to environmental influences. Limited size and energy also typically means restricted resources.
- Node mobility, node failures, and environmental obstructions cause a high degree of dynamics in WSN. This includes frequent network topology changes and network partitions. Despite partitions, however, mobile nodes can transport information across partitions by physically moving between them.
- The resulting paths of information flow might have unbounded delays and are potentially unidirectional. Communication failures are also a typical problem of WSN.
- Another issue is heterogeneity. WSN may consist of a large number of rather different nodes in terms of sensors, computing power, and memory.

ADVANTAGES OF WSN

The WSNs has revolutionized the world around us. They are becoming integral part of our lives, more so than the present-day computers because of their numerous advantages as mentioned below:-

- Ease of deployment

- Extended range of sensing
- Improved lifetime
- Fault tolerance
- Improved accuracy
- Lower cost

Design Challenges

The design of WSN is influenced by many challenging factors. They are following:-

- Node deployment
- Energy consumption without losing accuracy
- Data Reporting Model

[II] PROBLEM FORMULATION

One of the biggest problems of sensor networks is power consumption which is greatly affected by the communication between nodes. To solve this issue, aggregation points are introduced to the network. This reduces the total number of messages exchanged between nodes and saves some energy. Usually, aggregation points are regular nodes that receive data from neighboring nodes, perform some kind of processing, and then forward the filtered data to the next hop. Similar to aggregation points is clustering. Sensor nodes are organized into clusters, each cluster having a "cluster head" as the leader. The communication within a cluster must travel through the cluster head, which then is forwarded to a neighboring cluster head until it reaches its destination, the base station. Another method for saving energy is setting the nodes to go idle (into sleep mode) if they are not needed and wake up when required. Of course, the challenge is to find a pattern at which energy consumption is made evenly for all the nodes in the network.

In wireless environments, both congestion and link level bit error can cause packet loss, which deteriorate end-to-end reliability and quality of services, and furthermore lower energy-efficiency. Other factors that can result in packet loss include node failure, wrong or outdated routing information, and energy depletion. The energy is a critical factor in order to extend lifetime of the network, since nodes once deployed cannot be recharged. The lifetime of a network is nothing but the time until a certain number (or percentage) of the sensor nodes run out of energy.

The proposed work is divided in the following phases:

1. Locating the Low Energy Node.
2. Defining it in the list of Block Nodes/Critical Nodes.
3. Find alternate node such that efficiency of system should not degrade and transfer the packets of low energy node through this node.

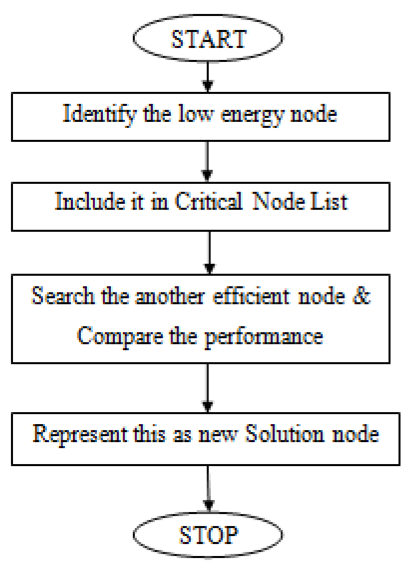

Fig 1. Flow Diagram

[III] EXISTING ALGORITHM

/*S is the source node and D is the destination node, the network defined is dynamic*/

{

1. Find all the nodes that occur in path between source and the destination.

These nodes are representing by Node List (1 to N).

2. for i=1 to N
3. {
4. If (Packet Loss Node List (i)) > MAX_THRESHOLD_VALUE)
5. {
6. then Packet Loss Node = low energy node.
7. {}}}

[IV]PROPOSED ALGORITHM

The steps described above are implemented by using NS2.

Algorithm(S,D)

/*S is the source node and D is the destination node, the network defined is dynamic*/

{

1. Find all the nodes that occur in path between source and the destination. These nodes are representing by NodeList(1 to N).
2. for i=1 to N
3. {
4. if(PacketLoss(NodeList(i))> MAX_THRESHOLD_VALUE)
5. {
6. find the list of compromising nodes for Node NodeList(i). This list is represented by Compromising(1 to K)
7. Select any of the compromising node from this list and use it in place of node dropping the data packet

   NodeList(i)=Rand(Compromising,1,k)

8. if K= 0 /* if there is no compromising node*/
9. {
10. NodeList(i)=Include New Node
11. }

}}

[V] SIMULATION OF EXISTING WORK

Simulation of existing work is performed over 50 nodes. Nodes in the network are in random position. In this scenario there is a source node that will broadcast the data and all the neighboring nodes will do the same after receiving it.

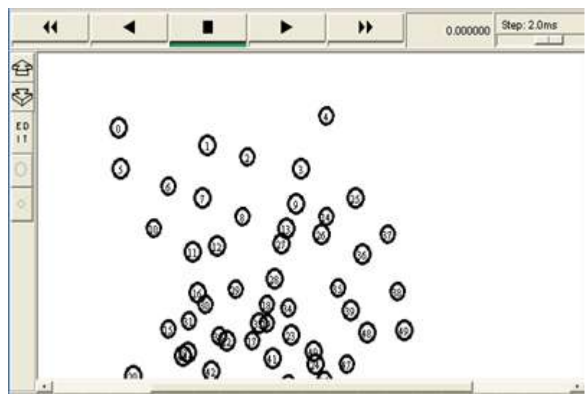

Fig 2. Initial position of the nodes

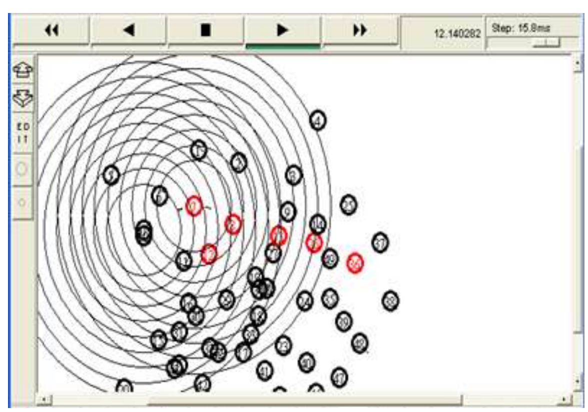

Fig 3. Red color nodes with low energy

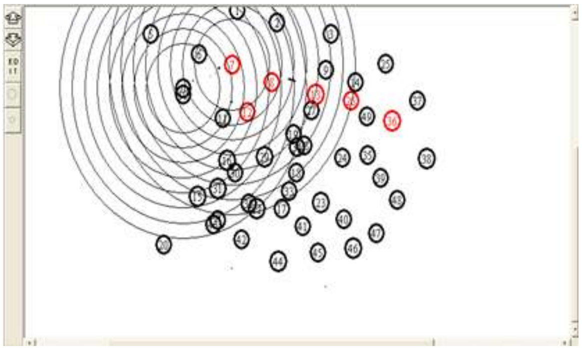

Fig 4. Low energy nodes dropping packet

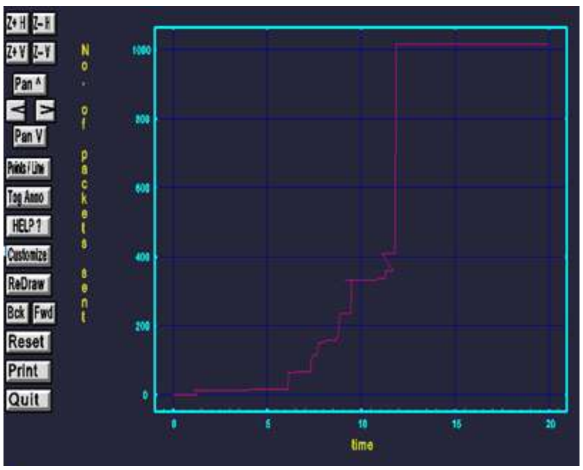

Fig 5. No of Packets Sent

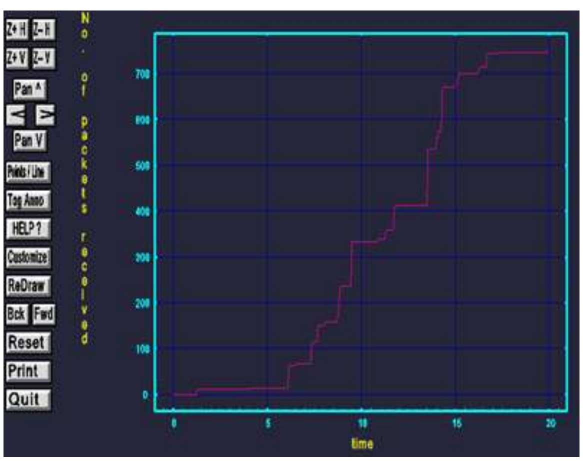

Fig 6. No of Packet Received

[VI] SIMULATION OF PROPOSED WORK

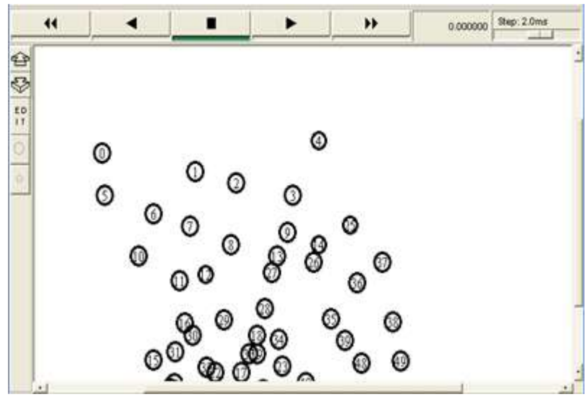

Fig 7. Initial position of the nodes

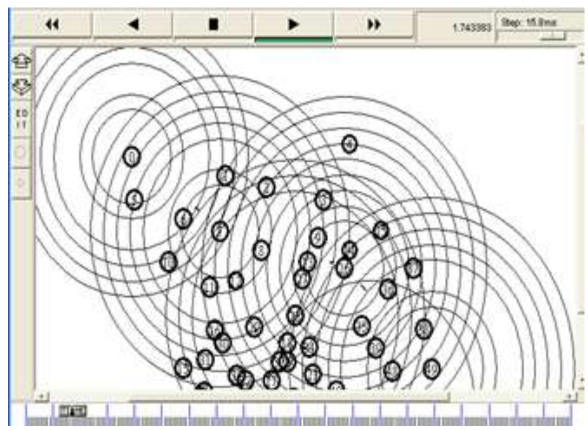

Fig 8. Broadcasting Packets

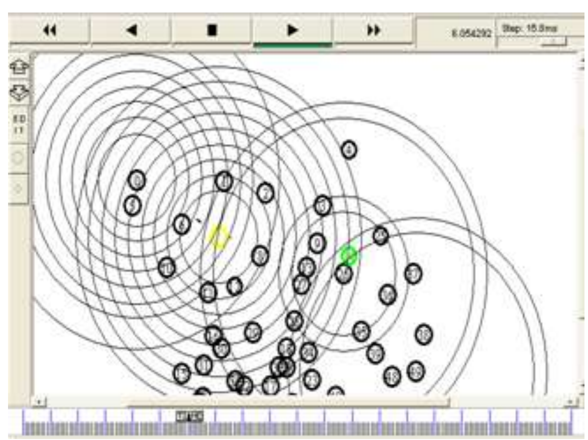

Fig 9. Nodes losing energy

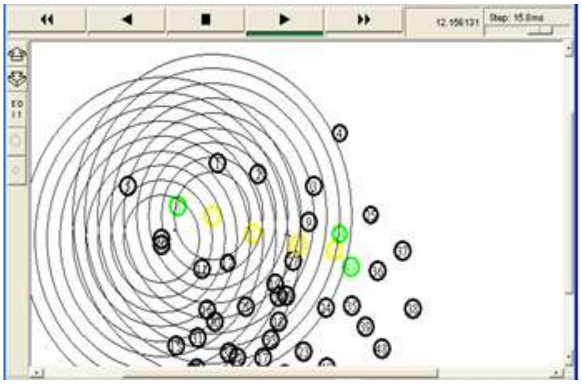

Fig 10. New nodes replacing low energy nodes

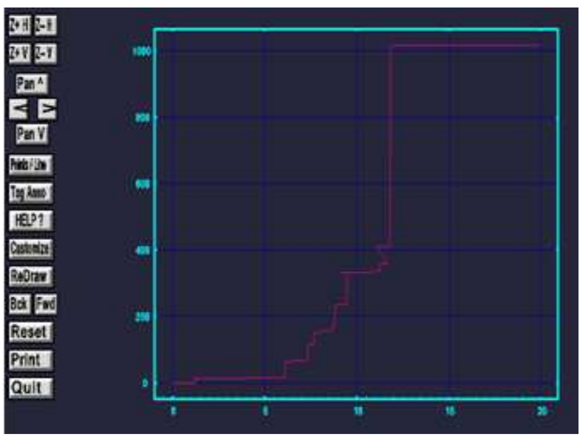

Fig 11. Number of Packets Sent over time

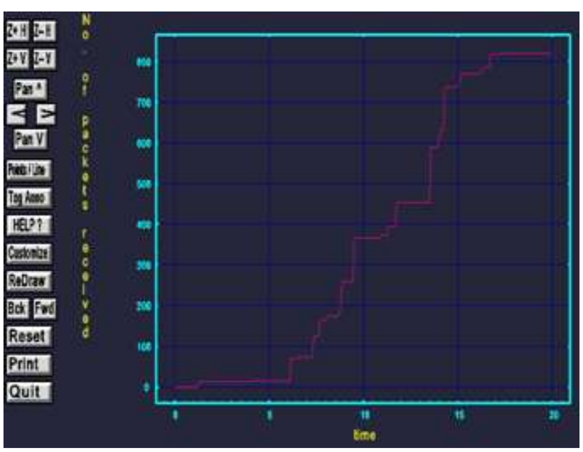

Fig 12. Number of Packets Received over time

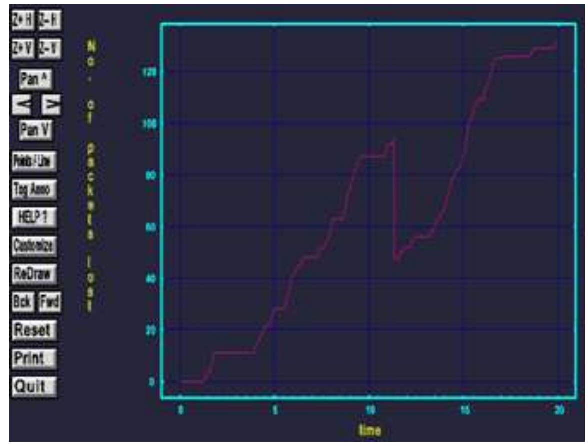

Fig 13. Number of Packets Lost over time

[VII] FUTURE DIRECTION

We can enhance our work by including the detection of different kind of attacks on each node. These attacks can include the rushing attack, black hole attack etc. We can also enhance the work respective to the congestion avoidance algorithm.

REFERENCES

[1] A.Wang, W. R. Heinzelman, and A. Chandrakasan. Energy-Scalable Protocols for Battery-Operated Micro sensor Networks. In Proceedings of the 1999 IEEE Workshop on Signal Processing Systems, pages 483–492, October 1999.

[2] Agre, J. And Clare, L., "An Integrated Architecture For Cooperative Sensing Networks," IEEE Computer Magazine, vol. 33, no. 5, pp. 106–108, May 2000. doi: 10.1109/2.841788

[3] Akkaya K and Younis M, "A Survey on Routing Protocols for Wireless Sensor Networks," Ad Hoc Network (Elsevier) [J], vol. 3, issue 3, pp. 325-349, May 2005. doi: http://dx.doi.org/10.1016/j.adhoc.2003.09.010

[4] Akramul Azim1 and Mohammad Mahfuzul Islam (2009), **"**Hybrid LEACH: A Relay Node Based Low Energy Adaptive Clustering Hierarchy for Wireless Sensor Networks," Proceedings of the 2009 IEEE 9th Malaysia International Conference.

[5] Akyildiz, I., Su, W., Sankarasubramaniam, Y. and Cayirci, E. (2002), "A Survey On Sensor Networks," IEEE Communications Magazine, vol. 40, no. 8, pp. 102–116, August 2002. doi: 10.1109/MCOM.2002.1024422

[6] Allirani, A.; Suganthi, M. An Energy Efficient Cluster Formation Protocol with Low Latency In Wireless Sensor Networks. World Acad. Sci., Eng. Tech. 2009, 51, 1–7.

[7] An Energy-Aware Routing Protocol in Wireless Sensor Networks Ming Liu 1,*, Jiannong Cao 2, Guihai Chen 3 and Xiaomin Wang 1 Sensors 2009

[8] Bonnet, P., Gehrke, J. and Seshadri, P., "Querying The Physical World," IEEE Personal Communications, vol. 7, no. 5, pp. 10–15, October 2000. doi: 10.1109/98.878531

[9] C. Jone, K. Sivalingam, P. Agrawal and J. Chen, "A Survey of Energy Efficient Network Protocols for Wireless networks," Journal of Wireless Networks, Kluwer Academic Publishers, vol. 7, no. 4, pp. 343-358, 2001. ISSN: 1022-0038. doi: http://dx.doi.org/10.1023/A:1016627727877

[10] Carlos Cordeiro and Dharma P. Agrawal, "Ad hoc & Sensor Networks, Theory and Applications," World Scientific Publishing, Spring 2006. ISBN No. 81-256-681-3; 81-256-682-1 (paper back).

[11] D.Baghyalakshmi, Jemimah Ebenezer, S.A.V. Satyamurty "Low latency and energy efficient routing protocols for wireless sensor networks" *IEEE* Second International Conference on Computer and Network Technology, *IEEE, pp* 1-6,2-4 Jan 2010.

[12] Dharma P. Agrawal, Ratnabali Biswas, Neha Jain, Anindo Mukherjee, Sandhya Sekhar and Aditya Gupta, "Sensor Systems: State of the Art and Future Challenges," chapter no. 20, "Handbook on Theoretical and Algorithmic Aspects of Sensor, Ad Hoc Networks and Peer-to-Peer Networks, " edited by Jie Wu, Auerbach Publications, pp. 317-346, 2006.

[13] Egen S and Varaiya P, "Energy efficient routing with delay guarantee for sensor networks," Wireless Networks, Springer, Netherlands, vol. 13, no. 5, pp. 679-690, June 16, 2006. doi: http://dx.doi.org/10.1007/s11276-006-8149-y

[14] Feng Wang and Jiangchuan Liu "Networked Wireless Sensor data collection: aggregation approach" Computer Standards & Interfaces28, Science Direct, 2010.

[15] J. Feng, F. Koushanfar, M. Potkonjak, "Sensor Network Architecture", Chapter 12, Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems.

[16] J. Kulik, W. R. Heinzelman, and H. Balakrishnan. Negotiation-based Protocols for Disseminating Information in Wireless Sensor Networks.

[17] Kevin Fall and Kannan Varadhan, NS2 Network Simulator Reference Manual, 2000.

[18] Lindsey, S.; Raghavendra, C. PEGASIS: Power-Efficient GAthering in Sensor Information Systems. In Proceedings of the IEEE Aerospace Conference, Los Angeles, MT, USA, 2002; pp. 1125–1130.

[19] Manjeshwar, A.; Agrawal, D. TEEN: A Routing Protocol for Enhanced Efficiency in Wireless Sensor Networks. In Proceedings of the 15th International Parallel and Distributed Processing Symposium (IPDPS'01) Workshops, San Francisco, CA, USA, 2001; pp. 2009–2015.

[20] Muruganathan, S.; Ma, D.; Bhasin, R.; Fapojuwo, A. A Centralized Energy-Efficient Routing Protocol for Wireless Sensor Networks. IEEE Radio Commun. 2005, 43, 8–13.

[21] "Node Sensing & Dynamic Discovering Routes for Wireless Networks" (IJCSIS) International Journal of Computer Science and Information Security, Vol. 7, No. 3, March 2010

[22] Pothuri P, Sarangan V and Thomas J, "Delay-constrained, energy-efficient routing in wireless sensor networks through topology control," in the Proceedings of 2nd IEEE International Conference on Networking, Sensing and Control, pp. 35-41, April 2006. doi: 10.1109/ICNSC.2006.1673114.