Performance and Analysis of PEGASIS Protocol for High Speed Networks

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Abstract - In High speed wireless sensor Network, Communication between sender and receiver can be done through Nodes. This Node senses information and transmit information from one point to other point until destination (or the base station). But these nodes have limited battery power and low bandwidth. Optimal route between sender and receiver saves more amounts of energy and power. PEGASIS protocol is improved over leach protocol, based on hierarchical network architecture proposed for high speed Wireless Sensor Network. In this paper, performance and analysis of PEGASIS is discussed and evaluated with simulator Network simulator (2.34) and compared with leach protocol.

Index terms — Hierarchical network architecture; LEACH; Greedy chain based data fusion;

I. INTRODUCTION

In High speed wireless sensor network is composed of huge number of the junctions which act as sensor nodes that can sense information. This information can be send to the base station with path dedicated by the routing algorithm. These nodes have limited computational power, limited number of nodes and limited Bandwidth. Effective usage of energy, prolong the life time of the node is main concern in wireless sensor network.

II. HIERARCHICAL NETWORK ARCHITECTURE

In hierarchical network architecture some nodes combine to form clusters as shown in fig1. Each nodes act as cluster and among all clusters one node will act as a cluster head and this cluster heads receive information from clusters and transmit information to the Base station. As shown in fig1

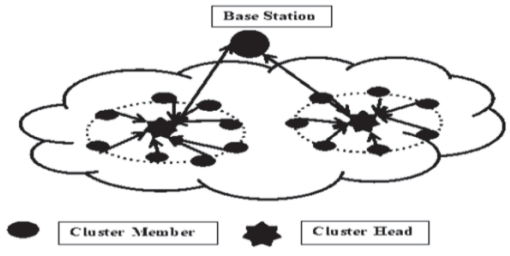

Fig1. Hierarchical Architecture

A. LEACH PROTOCOL

Leach protocol is same as that of Hierarchical Architecture, only 5% of nodes are used as the cluster heads.

There are sever disadvantage of LEACH protocol are, when due to any reason Cluster head dies, the data gathered by the cluster would never reach its destination and that total cluster becomes useless. Clusters nodes along with cluster head nodes are divided randomly, which results in uneven distribution of Clusters i.e... Some group of clusters are having more nodes and some group clusters are having lesser nodes. Some group of cluster having cluster heads are at the near to the base station and other group of cluster having cluster heads are at the far away from the base station. Cluster heads near base station will have less distance to base station so requires less energy and cluster heads nodes faraway from base station will have more distance to base station so requires more energy, this phenomenon can cause energy consumption increases and have great impact on the performance of the total network.

B.PEGASIS PROTOCOL

Full form of PEGASIS is **"**POWER EFFICIENT GATHERING IN SENSOR INFORMATION SYSTEM".

PEGASIS protocol is improved over leach protocol based on the hierarchical network architecture based on greedy chain base data fusion algorithm.

III. WORKING OF PEGASIS PROTOCOL

Working of PEGASIS protocol is on greedy chain algorithm. In greedy chain algorithm farthest node N(n) is selected and get connected with the nearest neighbour N (n-1)to it,

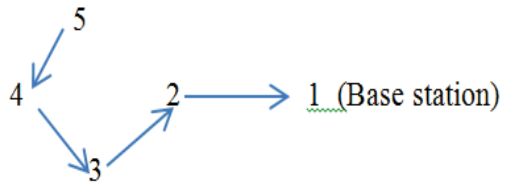

Fig2. Greedy chain algorithm (5 nodes)

In the above fig2. Greedy chain Algorithm 1, 2, 3, 4 and 5 are nodes. Where node5 is for away from Base station. Neighbour nodes of node5 are node4 and node2 nodes. Now node5 can able to get connected with node4 or node2 but distance between node5 to node4 is less compared with distance between node2 and node5 so node5 get connected with node4.and so on node4 get connected with node3, node3 get connected with node2 and finally node2 get connected with node1 which is base station.

If any node in the network dies then bypass the node for example in the above network if node 3 dies then node4 get connected with the node2.

At each and every node PEGASIS performs data fusion except at the end nodes in the chain. Data packets received from previous nodes chain and fuse its own data signals to form single packet of same length and transmits to next level of chain as shown in fig3.

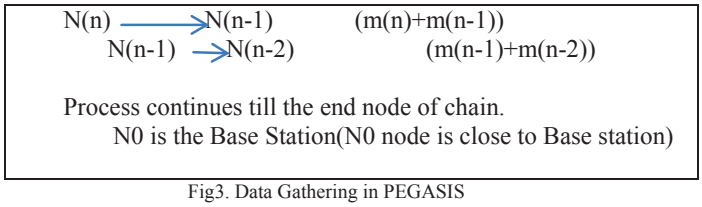

Fig3. Data Gathering in PEGASIS

In the above example, node5 will pass its data to node4. Node4 fuses node5's data means node4 data combine with node5 data and forms a new data, and this new data is sent to node3, Again node3 fuses node4's data with its own data, forms a new data transmits to the node2. After node3 passes to node2, Node2 fuses node3's data with its own and forms a new data and then transmits to the node1 (Base station).

IV. SIMULATION RESULTS

PEGASIS protocol is simulated with Network simulator (NS2.34) for performance analysis. Simulation parameters taken are shown in the table 1 and compared with previous leach protocol.

Table 1. Simulation Parameters

Description	Specification
Number of Nodes	100
Simulation Area	100 * 100
Base Station Position	50,175
Individual Node's Energy	2 joules
Stopping time of Simulation	3600 seconds

A. Energy Consumption

Energy consumption of network of PEGASIS and leach protocol are shown in fig4. Each node contains 2Joules of energy, total 200Joules is to be consumed by the network and total number of nodes taken for simulation is 100.

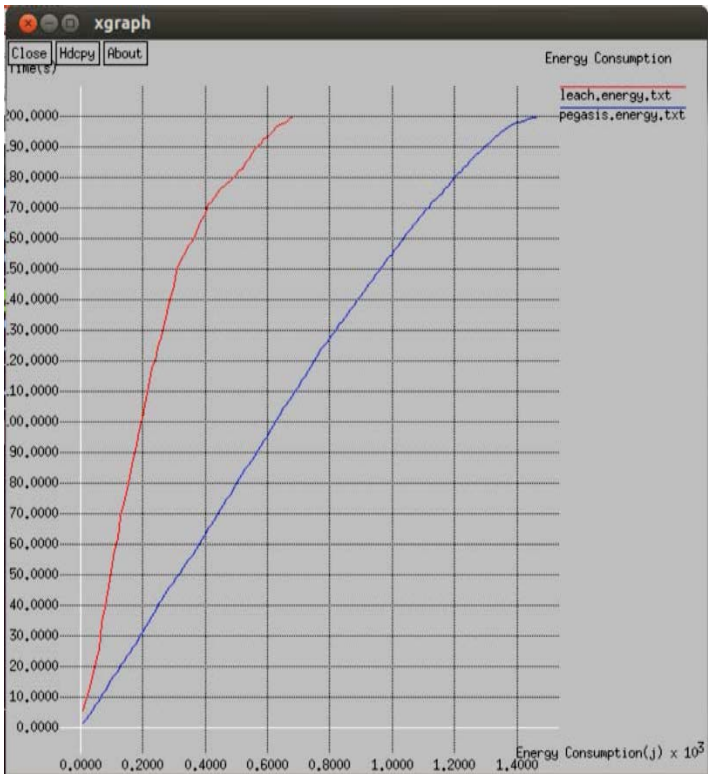

Fig4. Energy Consumption

In the above fig4 x-axis represents energy consumption (joules) and y-axis represents time(sec). By using PEGASIS protocol energy utilization can be effectively utilized than leach protocol

B. Number of Alive Nodes

Number of alive nodes of network of PEGASIS and leach protocol are shown in fig4.

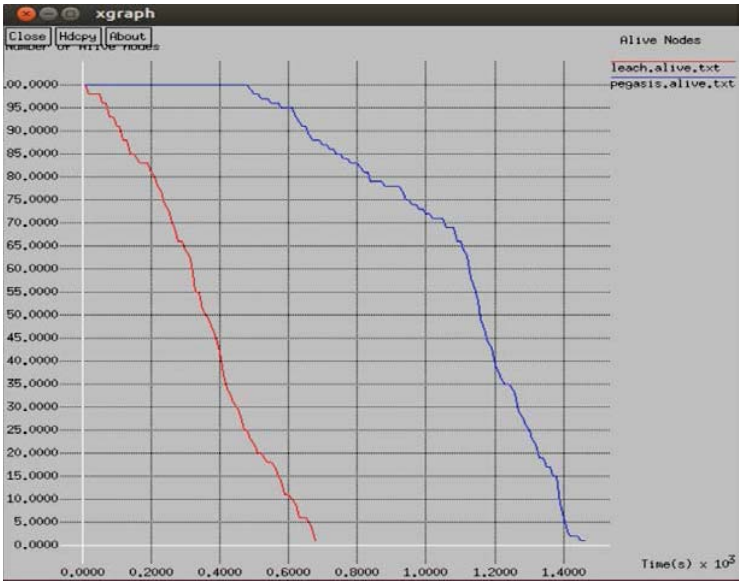

Fig5. No of Alive Nodes

In the above fig5 x-axis represents Time (sec) and y-axis represents No of Alive nodes. By using PEGASIS protocol no of alive nodes are more than the leach protocol.

C. Data Gathered

Data Gathered of network of PEGASIS and leach protocol are shown in fig6.

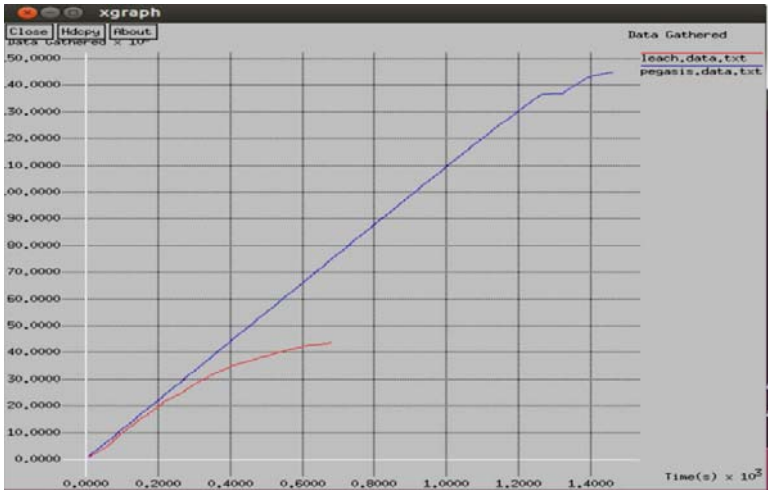

Fig6. Data Gathered

In the above fig6 x-axis represents Time (sec) and y-axis represents Data Gathered. By using PEGASIS protocol constant data rates can be maintained than leach protocol

V. CONCLUSION

In this paper simulation of PEGASIS protocol and leach protocol is presented with simulator network simulator (NS2). Results show that the performance of PEGASIS protocol is much better than leach protocol. But node which is far away from base station takes more time to reach base station in the network. Greedy algorithm based on data fusion is sometimes not form of the overall optimal path for transmission. By proposing solution for realization of these assumptions PEGASIS's protocol working can be improved practically.

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