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Data Aggregation In Wireless Sensor Network

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ABSTRACT
The entire sensor node in wireless sensor network is tiny devices, since resources are quite limited. Hence we place more sensor node into network. Data collected by sensor nodes have much redundancy. So main aim is to removal of data redundancy, this can be achieved with the help of data Aggregation method. Data Aggregation method reduce redundancy. Hence number of transaction had reduced due to which we save the energy of each node. Various applications can be embedded into sensor node to sensing reading from surrounding. Packet generated by each node according to event occurs into environment and send result to the base station. Data aggregated method to remove redundancy and transmit packet into the network. Static routing work on predefine path so that this method is not more suitable for Data Aggregation. Hence we apply dynamic routing.
Keywords: Data Aggregation, wireless sensor network, static routing, Dynamic Routing

I. INTRODUCTION

Now a day wireless sensor networks (WSNs) are used in all field to collect information form surrounding. Wireless sensor network(WSN) have various application such as moving target tracing[1], habitat monitoring[2], health care[18], fire detection[3], health monitoring[5], seismic events, vibrations, many network a lifetime in the order of several months, or even years, may be required. Therefore, the critical question is that: ‘‘How to maximize the network lifetime?”. Hence main issue in wireless sensor network is energy. Large amount of energy required for transmitting and receiving data from source to destination node, it also depends upon distance between nodes. Main issue in WSN is to increase the lifetime of network that can be improved with the help of data aggregation method. Data aggregation method is defined as collecting information generated by source node, send to aggregator node. Aggregator node is eliminating the redundant data after that send remaining packet towards the base station. This method is considered as an efficient technique to increase the lifetime of network [7]Figure 1 consists of two models. 1) Data Aggregation model. 2) Non- Data Aggregation model. In this model we define two type of node that
are regular node and intermediate or Aggregator node. So we define 1, 2, and 3 as a regular node that collected the information from network according to event and send data toward Aggregator node. Where sensor node 4 is an Aggregator node that perform aggregation and sensing at the time. In the above figure 1 there are 3 packet transfers into the network and single data packet are send to the base station. In second model 3 packet generated by source or regular node and all are transfer to the base station, on this scenario we say that with the help of data aggregation method we reduce no of packet before sending to the base station. Regular node sense data from environment and send toward Aggregator node. Generally Aggregator node gather data from multiple regular nodes of the network aggregates the data packet with the help of some standard aggregation function such as sum, count, max, min and average then sends aggregates result to other aggregator node or sink node that generate the query

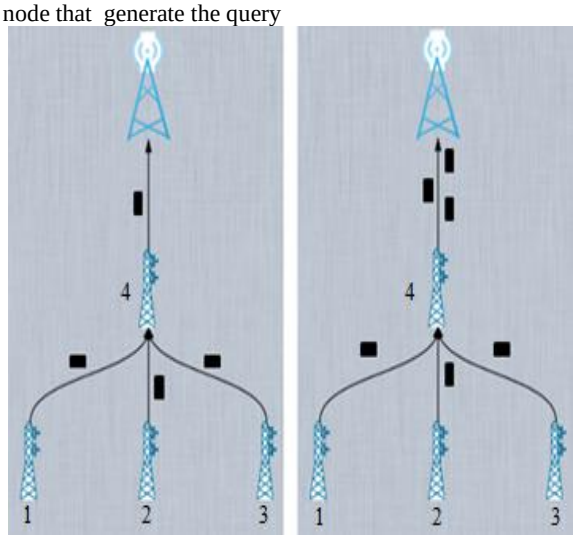

Figure No.1 Aggregation And Non- Aggregation method

In data aggregation we reduce Average Number of Transaction (ANT). Although the timing scheme proposed in [8] ensures that the entire packet meets each other at same time for Aggregation. Static

routing is define as per define path between source node to destination node and that is fixed due to which arise a problem such as packet loss, traffic conjunction, packet delay and so on. Dynamic routing is defined as path can be decided at the run time of packet form source to destination [9]. To design the dynamic routing, first we know that the routing metric that can be determined on node depth, is determined how many number of hop is require reaching sink node, is considered to ensure packets reach the sink at last. Besides, the metric must be relevant with the packet attribute. Enlightened by the concept of pheromone, which will be drop along the path where the ants pass and evaporate with time, in ant colony [10], we draw an analogy between the pheromone and the packet attribute. A packet will drop attribute-dependent pheromone when packet passing a node to attract towards packets with same attribute node .In this paper remaining wok is II Related work. III. Methodology. IV Result, V Conclusion. data for aggregation required less power as compare sending multiple packets having similar data [11]. There is different type of algorithms discus in literature for performing aggregation. These mechanisms are of three types such as in network data aggregation, hybrid data aggregations and global data aggregation scheme [12] Proposed an in network data aggregation scheme for location aware routing in wireless sensor networks. In order to reduce the size of transmitting packets over the networks, they utilize group by queries. The weakness of this lies in construction mechanism of routing tree which is random. For information retrieval, base station broadcast a message and next node to be selected is the one who broadcasts the base station message first. In chain based data aggregation mechanism [13] sensor nodes send their data to the closest neighbors. Aggregation activities are done at the cluster heads. Ordinary nodes sense data and send to their cluster head which is forwarded to a base station or other cluster head but it apply aggregation process before send data from one cluster head to another. However, if distance between cluster head and ordinary node is large then energy required to transmit data is large. In [14] direct diffusion was presented which is focused on reducing the size of data retrieved from different sources by eliminating redundancy and reducing the number of packets transmitted over the network. But the problem with this approach is the identification of alternative optimal path when the current path is lost. But the problem with this approach is the identification of alternative optimal path when the current path is lost Gradient based routing [17] is next version of direct diffusion in which traffic is distributing evenly due to this the network lifetime is maximized. In this mechanism, sensor nodes always know that depth of node form based station also called the height of nodes.

II. RELATED WORK ON DATA AGGREGATION

Wireless sensor network are very challenging research area for design Energy efficient routing protocols. Sensor nodes are tiny device due which resources is very less hence traditional routing protocols are not suitable for WSN [9]. One of the most suitable methods is data aggregation in WSN. Data aggregation is gathering data from neighboring node, removal of redundant data from that node hence reducing the number of packets transmitted over the network because processing The packets are forwarded over that link having largest gradient values. The gradient is obtained by subtracting a node's height from that of its neighbor nodes. A new deterministic data aggregation method for wireless sensor networks was presented in [15]. This technique uses a deterministic sampling approach in comparison to random sampling. The size of resulting sample is very small and requires less transmission power which results in prolonging network lifetime. Data compression is also used as an aggregation method in wireless sensor network [16] in this method use piecewise approximation algorithm which compresses data. Due to the reduced size of packet, hence the network lifetime is increased. The disadvantage of this algorithm is the loss of data as well as it is useful to single dimensional time series. Data aggregation in tree based networks is performed at the intermediate nodes and is suitable for applications where in network data aggregation is required. In energy aware data aggregation tree algorithm [14], a control message is periodically broadcasted by the base station. The timer is started by each node on receiving this message and is refreshed if a new control message arrived during the time count down time. However, most of these algorithms were developed for special application and not generalized there always need for efficient energy aware and robust data aggregation algorithm.

III. Methodology

1. Network model

To design the network model, we consider that WSN consist of *N* homogeneous nodes are uniformly spread over the network in a square deployment area. This squared area hiving border B. The left bottom vertex of deployment area locates at (0_*x*, 0_*y*) in Cartesian coordinate plane. In addition, we take some assumptions:

1) Sink node (base station) and sensor node in network are Time synchronized and are stationary after deployment, sink node always place at co-ordinate (BS_x, BS_y) out of deployment area; 2) communication between node is symmetric and each node is adjust its transmission power according to the distance between transmitter and the receiver; 3)

nodes in network as well as base station are location-aware. in which the sensed data only make sense with location information, for other applications, the locations of BS and nodes can be easily obtained by utilizing localization algorithms. The time synchronization algorithms and localization algorithms are not discussed in our work.

1. Energy consumption model

We use the same energy consumption model used in WSN is mainly depend upon the distance between the transmitter and receiver, if distance is less then it required less amount of energy and if distance is more then it required lager amount of energy to send massage between the node. The energy spent for transmitting an *l*-bit(l = length) long message over distance *d* is where *E* is the energy dissipated per bit to run the transmitter or the receiver circuit. To receive this message, the expended energy is

$$ERx(l) = l \times E \quad (1)$$

The consumed energy by node of aggregating *m* messages to send *l*-bit is

$$EA(m, l) = m \times l \times EDA \quad (2)$$

where *EDA* is the energy dissipated per bit to aggregate message signal.

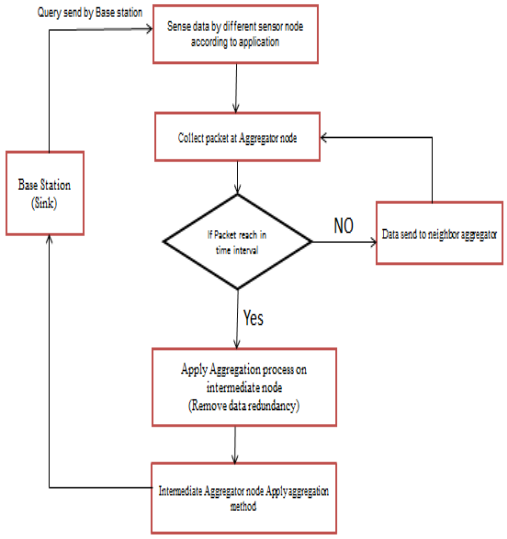

Figure no.2 working mechanism of data Aggregation method

Figure 2 shows that the real working mechanism of the data aggregation method. In general we consider that the N number of sensor node is placed into the squared area of boundary B. in this process some node are work as a simple node that only generates packets and send to the aggregator node this node is called as regular node. Aggregator nodes apply the data aggregation process on that node. This process simply collect packet from the neighboring node eliminates, redundant packet, also apply sum, max, min, average function at that node to reduce the size of the packets. This process mainly depends upon the time given to the aggregator node to apply aggregation process. Here, we assume every node transmitting data at the rate 50 packet per sec. Step 1: sensing data by node from physical environment.
Step 2: Each Aggregator node gives same time interval to aggregation process. (in our reading we assume 13 sec)
Step 3: Collected data from each Aggregator node.

As shown in Figure 3, From any other node, the aggregated data say T1and T2 is coming to node s. T1 have packet size 400 and T2 have 500. The same data having same property is combined together and redundant property is removed. Thus the Packet size is minimized from 900 (400+500) to 700.

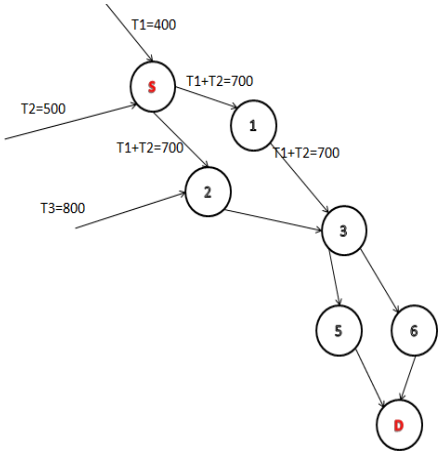

Figure No.3 sensing packet from network

Step4: after Aggregation send data to other intermediate node.
As shown in figure 4, if any intermediate nodes getting any other packet having same property, then on that intermediate node again get aggregated and packet size decreases.

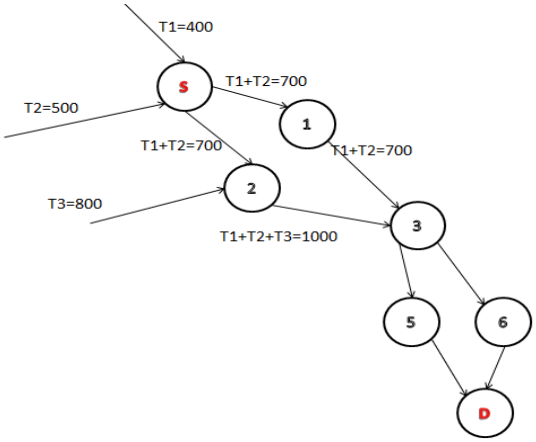

Figure No.4 transfer packet to Aggregator node

Therefore, on Node 2, data is aggregated. As shown in figure 5, Node 3 perform data aggregation on

incoming packets from node 1 and node 2, and actual packet size minimized to 1000

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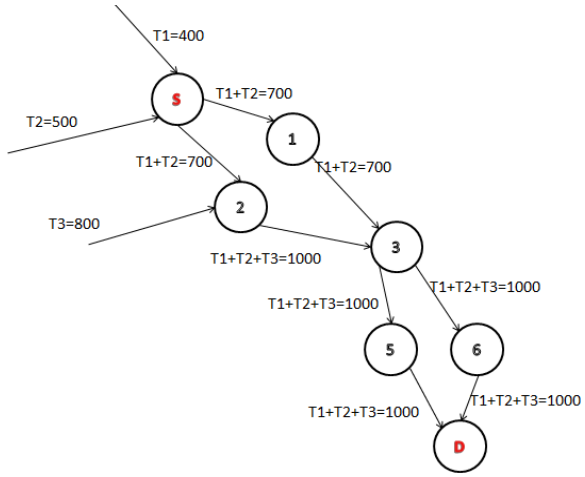

Figure No.5 packet reach to sink node

Step 5: through intermediate node Data reach to sink node.

AS, T1, T2 and T3 have same property of Temperature sensing, we can apply data aggregation method on these packets. Thus, till reaching the destination, as shown in figure

5, packet size decreases from 1700(500+400+800) to 1000. In result, if packet size decrease proportionally packet loss decrease.

IV. RESULT

We design system in Ns 2 simulator with 400 sensor nodes is randomly deployed into selected field according to the (X, Y) co-ordinates. We locate the sink node out of the field but in the range of communication network. The communication range allocate to each node is 15m. The packets are randomly generated with average interval l00ms.Figure 6 shows the comparison between two model that is Non-Aggregation model and Aggregation model. The result showed in the form of packet transfer form source to destination node. Y-axis shows that no of packet transmitted by each event. X- axis shows that the no of event generated packet and send to sink node. This graph shows that Aggregation method send less packet as compare to the non-Aggregation process.

Fig. 6 No of packet transfer in each event

The network Traffic is depends upon the waiting packets at the intermediated node. Thus if packet size become small the waiting packets in the network is minimize and packet loss is reduced. In our system ,we assume every packet transmitting 50 packets per second and for aggregation, waiting time is 13 sec. As Shown in Figure 7, average waiting time at every node is more in non-aggregation method than aggregation.

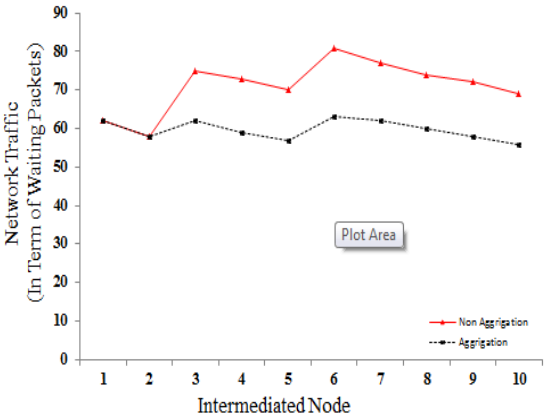

Fig.7 Traffic in the network at each intermediate node

V. CONCLUSION

This paper, mainly focus on the problem of energy consumption in network for maximizing the lifetime of the sensor. In homogeneous sensor network, Data Aggregation method is one of the method for increase lifetime of network. Data aggregation is efficient method to save more amount of energy in the network. Simulation Result shows how no. of packet loss and size of packet can be minimized by using the concept of Data Aggregation. In future we can use this method in the heterogeneous where network contain different kind of sensor. With some identification of packets, such kind of approach gives a more energy efficient network.

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