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Secure And Energy Efficient Data Aggregation Routing Protocol To Reduce Congestion in Wireless Sensor Network

*C.Priyadarsini[1] Dr.R.Prema[2]
[1]*Research Scholar, Department of Electronics and Communication Systems, KarpagamUniversity,Karpagam Academy of Higher Education, Coimbatore, Tamil Nadu-641021phone:8220032324*
[2]*Associate Professor, Department of Electronics and Communication Systems, Karpagam University, Karpagam Academy of Higher Education, Coimbatore, Tamil Nadu-641021*
Phone: 9345706892

Abstract: *Due to the development of information technology, data transmission plays a significant role in communication .Wireless Sensor networks are one such communication paradigm. WSN consists of a large number of battery-powered wireless sensor nodes and one key issue in WSNs is to reduce the energy consumption while maintaining the normal function of WSNs .Data aggregation scheme that reduces a large amount of transmission is the most practical technique. Data aggregation as a typical operation in data gathering application can cause a lot of energy wastage since sensor nodes, when not receiving data may keep in the listen state during the data collection process. This research work proposes to minimize the end to end delay. The conventional algorithm queuing aid employed for multiple path, shortest path and energy efficient with low latency performance metrics such as secure and energy consumption of nodes, network lifetime and aggregation latency are chosen. The proposed scheme has been compared with existing data aggregation mechanism. Simulation results proved that the proposed schemeoutperforminterms of preferred performance matrices.*
Keyword:*, Dataaggregation, End to end delay, Energyrouting, Queuing algorithms,Wireless sensor Networks.*

I. Introduction

Wireless sensor network are increasingly used in several application a sensor node is severely constrained in terms of computation capability and energy reserves. A straightforward method to collect the sensed information from the network is to allow each sensor nodes reading to be forwarded to the basestation,possible via other intermediate nodes, before the base station processes the receive data.However this method is prohibitively expensive in terms of communication overhead. Energy efficiency of data collection is on of the dominating issues of wireless sensor network(WSN).Data aggregation is a fundamental operation aiming to conserve energy by reducing the number of packet transmission through the network.

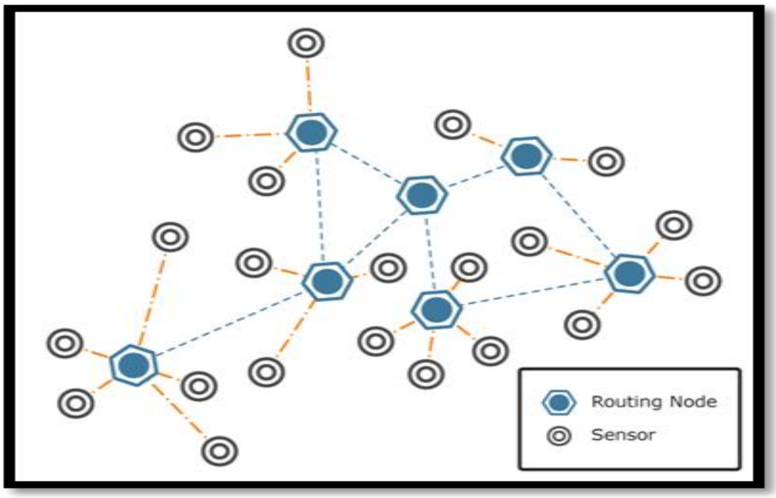

Figure 1. Wireless sensor network with routing nodes

Data aggregation is the process of collecting and aggregating the useful data. Data aggregation is considered as one of the fundamental processing procedure for saving the energy[1-5]. Data coming from multiple sensor nodes are aggregated as if they are about the same attribute of the phenomenon when they reach the same routing node on the way back to the sink. A cluster head(CH) is selected among nodes lies within the each cluster CH are going to be responsible for administration of all different nodes inside several cluster and collecting data from the nodes with the cluster and transferring the information to the neighbouring cluster head for more information to the neighbouring cluster head for more information exchange and updation[7].The newly arrived nodes will be assigned as cluster head if the global cost of arrived node is minimum, otherwise other cluster nodes are going to be given opportunity to participate and global cost is once more recalculated thereafter the data aggregation approach is presumed as the collection of data and numerous queries from the user and are checked and transformed into low level schemes by a query processor. All data collected and aggregated is stored at a storage location in database server. The rest of the paper is organized as follows. The next section reviews the literature by using Queuing method.

II. Related Work

An extensive literature review is presented, [8] an anycast packet-forwarding scheme to reduce the event-reporting delay and to prolong the lifetime of wireless sensor networks employing asynchronous sleep-wake scheduling.Here First, when the wake-up rates of the sensor nodes are given, it develop an efficient and distributed algorithm to minimize the expected event-reporting delay from all sensor nodes to the sink. Second, using a specific definition of the network lifetime, it study the lifetime-maximization problem to optimally control the sleep-wake scheduling policy and the any cast policy, in order to maximize the network lifetime subject to a upper limit on the expected end-to-end delay. In [9] The Response time minimization algorithm is used to share the load to the available VM efficiently. It improves the response time and minimizes the delay time. Hence the load balancing is achieved. Several performance metrics such as availability, utilization, and responsiveness used to investigate the impact of different strategies on both provider and user point of views. This paper identifies that Response Time Minimization grid task scheduling algorithm outperforms the Round Robin and Equally spread algorithm in a heterogeneous distributed environment. In[10] this it introducedMcTMAC protocol that can efficiently handle the delay over multihop WMN and extended the time-slot assignment of the PETAR09 algorithm to multichannel time-slot allocation and enhanced the distance-1 channel assignment. In paper [11], the author proposed and established a relationship between packet priority and node energy in the form of the 'Priority-Energy Based Data Forwarding Algorithm', which decides on the best energy- efficient forwarding choice. Also, the proposed PEDF emphasis on reducing the workload on some specific nodes, depending on their power levels, and giving them time for replenishing their energy.

III. Overview of Queuing Network

Algorithm

STEP 1 :X(t)-The number of packets in 1^{st} queue of time t.
STEP 2 :Y(t)-The number of packets in 2^{nd} queue of time t.
STEP 3:Arrival processes in 1^{st} Queue is a posisson process with rate λ.
STEP 4: Infinite capacity of both queues service time distributions for 1^{st} and 2^{nd}
STEP 5: Queue service are exponential distribution with parameter μ1 and μ2 respectively.

Stationary Distribution.

$\Pi Q=0$; $\sum_{(n1,n2)\epsilon Q}\prod_{(n1,n2)} = 1$

$P(X=n1,Y=n2) = (1-\rho)\rho_1^{n1}(1-\rho_2)\rho_2^{n2}$;$\rho_1=\frac{\lambda}{\mu 1} \leq 1$; $\rho_2=\frac{\lambda}{\mu 2} \leq 1$,n1≥0;n2≥0.

Average Measures:

Let N$= \sum_{i=1}^{k} Xi$, E(N)$=\sum_{i=1}^{k} E(Xi)$, $=\sum_{i=1}^{k}\frac{\lambda i}{\mu i - \lambda i}$

Using Little formula

E(T)$=\frac{E(N)}{\lambda}$, E(R)=E(N)/λ, $=1/\lambda\sum_{i=0}^{k} E(Ni)$

Initialize all sensor nodes in the network and assign nearest sensor node as cluster head and search shortest path and minimize the waiting time so it reduce the wastage of energy and improve the network lifetime.

IV. Simulation Settings And Performance Metrics

The simulation has been done using the NS-2 Simulator. The WSN nodes are placed randomly with varying node density between 500 and 1000. The packets are allowed to transfer in constant bit rate. It is assumed that all sensor nodes are homogeneous that have the same ability of communication and also know their neighbor nodes and their own location information by GPS. The performance metrics chosen are aggregation latency. The simulation settings are depicted in Table 1. A sample simulation scenario using NS2 is shown in Figure 2.

Table 1. Simulation Settings

Parameter Name	**Value**
Number of nodes	500 nodes to 1000 nodes
Terrain Size	1500 meters X 1500 meters
Initial energy / node	50 joules
Simulation time	1500 seconds
Baseline node power	6Mw
Simulation runs	10
Packet size	300 bytes
Radio Propagation	Free Space
MAC Protocol	802.11
Radio Range	200 meters

V. Results And Discussion

The simulations are conducted with varying number of nodes that ranges from 500 to 1000 . From the results, it is obvious that the proposed work reduced latency of data aggregation when compared to other existing protocols. The simulation result values of aggregation latency are given in Table 2.

ber of Nodes	**PDA [1]**	**MAI [2]**	**FASM [3]**	**Proposed Work**
500	8936	7564	5182	3805
600	9945	8472	6194	4109
700	10564	9047	7993	5286
800	11738	10562	8943	6846
900	12640	11593	9047	7943
1000	13856	12759	10047	8452

Table.2 Aggregation Latency (in milliseconds**)**

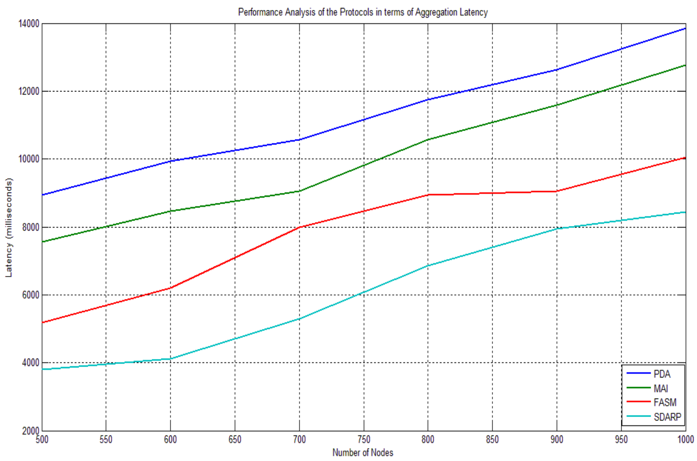

Fig.2 Number of Nodes Vs Aggregation Latency (milliseconds)

IV. Conclusions

This research work aims to propose minimizing end to end delaydata transmission for wireless sensor networks. The objective of this research work is to attain better throughput, reduced overhead packet and latency for data aggregation. Thesimulations is done with varying number of nodes ranges between 500-1000. Shortest routes from source sensor node and destination sink node are constructed and waiting stage is minimized. The results shows the better performance than existing protocols.

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