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Performance Analysis and Throughput Maximization Using Flooding Approach in Wireless Sensor Networks

B.Abinaya, R.Alageswaran, M.Ramesh

Department of ECE and Department of IT, Kamaraj College of Engineering and Technology, Virudhunagar, India

Department of ECE and Department of IT, Kamaraj College of Engineering and Technology, Virudhunagar, India

Department of ECE and Department of IT, Kamaraj College of Engineering and Technology, Virudhunagar, India

ABSTRACT: In Wireless Sensor Networks (WSN), researchers have proposed different routing protocols, particularly the routing protocols depending on clusters. The node reliability is a necessary parameter for the application based on sensor network to be effective .This is attributed to the fact that the usage of cluster based routing protocols have advantages like minimized control messages, re-usability of bandwidth, and enhanced power control. there are many cluster based routing protocols which reduce the energy consumption but have several disadvantages such as lack of QoS, inefficient transmission, etc. ,In order to overcome those problems, Mistrial Approach flooding Technique for wireless sensor network application is proposed in this paper. In this approach, the numbers of retransmissions are reduced and the *overlay packets are detected. From the simulation results it is understood that better energy consumption, Lifetime and Bandwidth efficiency are achieved by flooding management when compared to the conventional techniques.*

KEYWORDS: wireless sensor network, flooding approach, mistrial, packet formation, cluster head, motes

I. INTRODUCTION

Wireless sensor networks are recent trend, that involve deploying a large number of small nodes. Environmental changes are sensed by the nodes and are reported to other nodes through flexible network architecture. Sensor nodes are much suitable for deployment over large geographical areas or in hostile environments.

A WSN consists number of that is hundreds or thousands of low cost nodes that monitor the environment by having a fixed location or being deployed randomly. Nodes have a number of limitations due to their small size. Generally, the sensors communicate with one another using a multi hop approach. The flowing of data ends at special nodes called sink. The sensor network is linked to another network by sink node, also the sink node act as a gateway to disseminate the data that is sensed for further processing. Since Sink node do complex data processing ,they enhanced capabilities over simple regular sensor nodes, thereby justifying that sink nodes have energy, workstation/laptop class processors, storage , enough memory and computational power to perform well.

The Sensor networks have the biggest problems of power consumption, which is affected greatly by the communication between nodes. In network, aggregation points are introduced, to solve the above issue. Thus the total numbers of exchanged messages between nodes are reduced and energy is saved. The aggregation points are a regular node which receives data from neighboring nodes, process, and then forward the filtered data to next hop. Clustering is similar to aggregation points. Sensor nodes

are organized into clusters, each having a "cluster head" as leader. The communication within a cluster travel through the cluster head, which then is forwarded to a neighboring cluster head until it the destination ie , the sink node is reached. Energy is also saved by setting the nodes to go idle (into sleep mode) if they are not involved and wake up when required. In WSN application, the major challenge is to find a pattern at which energy consumption is evenly made for all the nodes in the network. The architecture of WSN is shown in figure1.

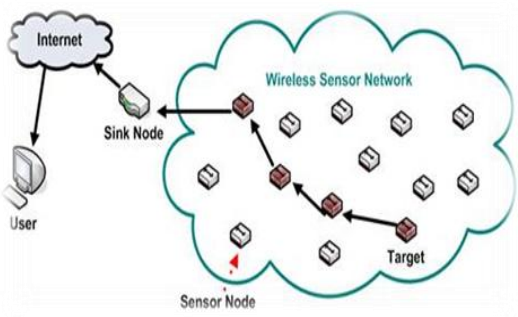

figure 1 Wireless Sensor Network

The utilization of WSN supports and offers number of applications, including traffic control, agriculture, habitat and environment monitoring, fire detection, object tracking, home automation, surveillance and reconnaissance, biomedical applications, machine failure diagnosis, energy management and inventory control .

II. PROPOSED APPROACH

A. Flooding in WSNs

In any flooding mechanism, there liability against message overhead is balanced. On the other hand, increasing reliability generally involves sending a more number of redundant messages and thus incurs a higher message overhead. In this worst case, the system risks in provoking broadcast storms. Also redundant messages are needed to reach all nodes and to recover from packet loss; hence reducing the overhead will generally decrease reliability.

The broadcast storm problem is common in flooding algorithms that it has given rise to a whole area of research. Storm-sensitive flooding approaches can be broadly classified into two classes: local-knowledge-based and overlay based. Local-knowledge-based approaches decide on whether to rebroadcast or drop a flooded message solely on the basis of local information. Most commonly, they use information from received broadcasts to adaptively determine the forwarding policy. Such algorithms are a natural fit for WSNs, as they do not need to maintain any kind of complex node-to-node state that might need to be adapted in the event of mobility or other topology changes.

In contrast, overlay-based approaches structure the node field according to some (local) topology and then use topological information to efficiently implement flooding and reliability. The problem here is that if nodes have low quality connections to neighbors and/or are in motion, then the overlay structure must be adapted. As a consequence, a high rate of management messages may be required and if a flooded message is propagated while the overlay is out of date, that message may experience a high loss rate. In the worst case, the system might end up in a state of churn, constantly adapting the overlay but never managing to achieve the high quality of flooding that the overlay is intended to support.

B. Flooding with Self-pruning

The simplest of the Neighbor Knowledge methods is the Flooding with Self Pruning. This protocol requires that each node have knowledge of its one-hop neighbors, which is obtained via periodic "Hello" packets. A node includes its list of known neighbors in the header of each broadcast packet. A node receiving a broadcast packet compares its neighbor list to the sender's neighbor list. If the receiving node would not reach any additional nodes, it refrains from rebroadcasting; otherwise the node rebroadcasts the packet.

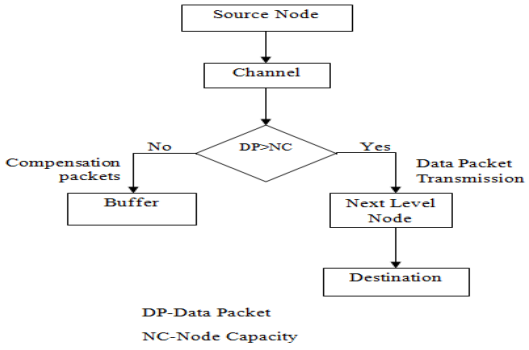

figure 2 Flow of Data from Source node to Destination

C. Mistrial Approach

Mistral algorithm is a proposed method which is a flooding technique. This technique overcome the disadvantages like lack of QoS, inefficient transmission, etc and also reduces the energy consumption. The Selective rebroadcasting approach, a dynamic clustering algorithm is used in Mistral algorithm. Flooding

management achieves better energy consumption when compared to the conventional techniques. The other merits of this method include high network life time, independent of clustering regions, high QoS due to removal of the retransmission packets in network. In this paper, lifetime of network performances is the basis of Qos.

In this method, the transmission from each sensor node is monitored by sink node. Then the comparison of the transmitted packets takes place with each node and retransmitted packets are eliminated in all nodes in cluster wise. The redundant packets are removed. The node capacity is determined in this approach. The packets are transmitted and reaches the destination, if the node capacity is greater than or equal to number of packets. If the node capacity is less than the number of packets, that is if the number of packets to transmit is 10 but the node capacity is 4 but means, only 4 packets are transmitted where as remaining 6 packets are stored in first round in compensation packet buffer After reaching the destination that is after completion of transmission of 4, the remaining 6 packets are transmitted and they reach the destination.

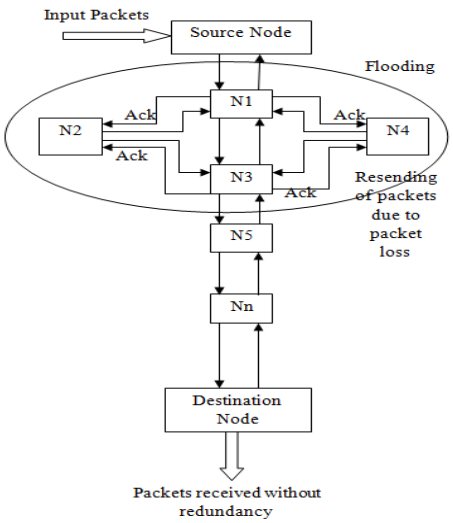

figure 3 Mistrial Approach

III. PERFORMANCE EVALUATION

A.Experimental Setup

The simulation involves 40 nodes that are uniformly placed in a flat grid of size 800x800 m. These nodes are divided into two priority categories, where 20 nodes are Low-Priority (LP) nodes, and 20 nodes are High Priority (HP) nodes. The data sink node is located in the center of the sensing area. Among the LP nodes, 10are initially deployed and another 10 nodes will be added to the network at the following time (Seconds): 0.5, 1, 1.5, 7, 9.5, 10, 11, 12, 15, and 20. Since both types of nodes will behave as LP nodes when added and these addition times cover all the stages of the approach, this configuration is valid to demonstrate the performance of the proposed flooding approach under a dense WSN setting. Every 300ms (T interval), a new data packet is generated by the node and it is expected by the sink before the start of the next interval.

Table 1
Simulation Parameters used for Mistrial approach

Parameter name	**Value**
Simulation Area	800×800
No. of nodes	40
Channel Type	Channel/ wireless channel
Radio Propagation Model	Two Ray ground
Simulation Time	20 s
Antenna Model	Antenna/ Omni Antenna
Energy Model	Battery
Interface Queue Type	Queue/ Drop Tail/ PriQueue

B.Results and Discussion

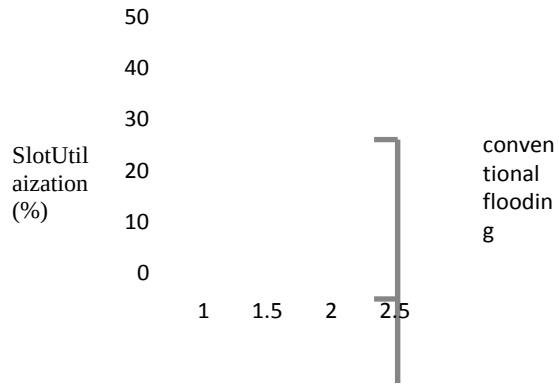

figure 4 channel usage comparing conventional and mistrial approach and slot utilization

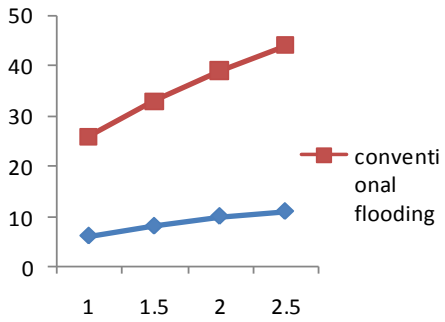

figure 5 percentage of loss with respect to the occurrences of retransmissions

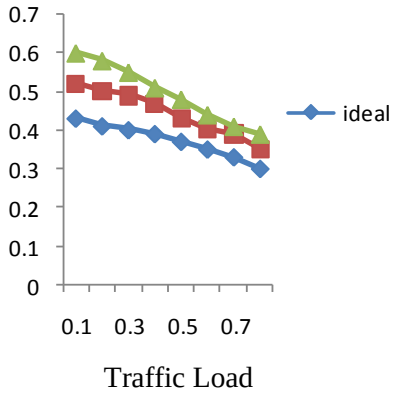

figure 6 calculation of throughput by having an ideal standard

The simulation results show better energy consumption when compared with the conventional methods. In figure 4 the number of retransmissions and slot utilization are considered as the parameter and the proposed approach has the minimum number of retransmissions. The time wasted in retransmissions due to the packet loss was represented in figure 5 then the maximum throughput is obtained in the mistrial approach was represented in figure 6.

IV. CONCLUSION

In this paper we have studied the flooding approach which has been implemented in a WSN network which consists of both the low priority and the high priority nodes. It is more cost effective and energy efficient than traditional WSNs with only standard nodes. On the other hand, it is more flexible and has better capability than the transmit-only nodes. The MISTRIAL approach is used to avoid retransmission of packets. The system has shown significant improvement in data delivery capability in both HP and LP priority categories as well as the optimized energy consumption when compared to transmit-only nodes. As the future work, besides addressing the above two issues, will further explore the potentials of hybrid WSN cluster architecture in building a larger system with multicluster and multihop communications (based on sinks and/or HP standard nodes).

REFERENCES

[1]JiaZhao,ChunmingQiao,RaghuramS.Sudhaakar, *"Improved Efficiency and Reliability in Single-Hop WSNs with Transmit-Only Nodes"*vol. 24,pp. 520-534.,March 2013.

[2] Mohammad Arifuzzaman, Mitsuji Matsumoto, Takuro Sato "*An Intelligent Hybrid MAC with Traffic-Differentiation-Based QoS for Wireless Sensor Networks"*vol. 13, no. 6, June 2013.

[3] T. Elbatt, C. Saraydar, M. Ames, and T. Talty, "*Potential for Intra-Vehicle Wireless Automotive Sensor Networks,"* Proc. IEEE Sarnoff Symp., 2006.

[4]SanghoYi,JunyoungHeo,YookunCho,JimanHong,"*PEACH-Power-efficient and adaptive clustering hierarchy protocol for WSN*" pp. 2842-2852,2007.

[5] M. Chen, S. Gonzalez, A. Vasilakos, H. Cao, and V.C.M. Leung, *"Body Area Networks: A Survey*," Mobile Networks and Applica- tions, vol. 16, pp. 171-193, 2011.

[6] Ritesh Madan and Sanjay Lall,"*Distributed Algorithms for Maximum Lifetime Routing in WSN"* vol, 5 pp, 2185-2193.

[7] J.Krumm, *"Ubiquitous Advertising: The Killer Application for the 21st Century," IEEE Pervasive Computing*, vol. 10, no. 1, pp. 66-73, Jan.-Mar. 2011.

[8] J.-S. Lin and C.-Z. Liu, "*A Monitoring System Based on Wireless Sensor Network and anSoC Platform in Precision Agriculture,"* Proc. IEEE 11th Int'l Conf. Comm. Technology (ICCT), pp 101-104, Nov. 2008.